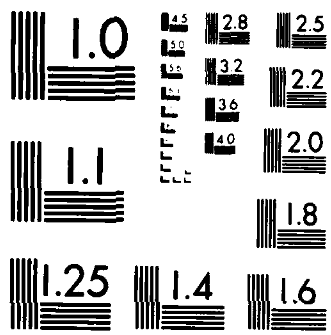
AD-A148 669 UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC) 1/3
STUDY(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD
J A SORENSON ET AL. SEP 84 CAA-SR-84-29
UNCLASSIFIED F/G 15/5 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963 A

STUDY REPORT
CAA-SR-84-29

AD

AD-A148 669

UTILIZATION OF INCREASED AIRLIFT CAPABILITY
(UIAC)

SEPTEMBER 1984

PREPARED BY
STRATEGY, CONCEPTS AND PLANS DIRECTORATE

US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MARYLAND 20814-2797

84 12 18 018

DISCLAIMER

The findings of this report are not to be construed as an official Department of the Army position, policy, or decision unless so designated by other official documentation. Comments or suggestions should be addressed to:

Director
US Army Concepts Analysis Agency
ATTN: CSCA-SP
8120 Woodmont Avenue
Bethesda, MD 20814-2797

CAA-SR-84-29

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CAA-SR-84-29	2. GOVT ACCESSION NO. AD-A148 669	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Utilization of Increased Airlift Capability (UIAC) Study		5. TYPE OF REPORT & PERIOD COVERED Study Report April - September 1984
		6. PERFORMING ORG. REPORT NUMBER CAA-SR-84-29
7. AUTHOR(s) CPT (P) J. A. Sorenson Mr. J. DePalma		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Concepts Analysis Agency 8120 Woodmont Avenue Bethesda, MD 20814-2797		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Deputy Chief of Staff for Logistics HQDA Washington, DC		12. REPORT DATE September 1984
		13. NUMBER OF PAGES 258
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

N/A

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Unsubscribed airlift capacity, Multiple Attribute Decision Making (MADM), Transportation cost avoidance,Cargo and route selection methodology, Air logistic Support, Transport aircraft, Air transportation, Mathematical models, Costs, Cost analysis.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study examined the increases in peacetime airlift capacity due to the Military Airlift Command's fleet expansion, determined the impacts on the Army transportation system and developed a process to select the most suitable cargo and route combinations to use the additional capacity. The results of analysis indicated that transportation cost avoidances could be realized by diverting surface port-packed cargoes to airlift; however by increasing airlift resupply, potential cost savings could increase.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

(NOT USED)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

STUDY REPORT
CAA-SR-84-29

UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC)

SEPTEMBER 1984

PREPARED BY
STRATEGY, CONCEPTS AND PLANS DIRECTORATE
US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MARYLAND 20814-2797

DEPARTMENT OF THE ARMY
US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MARYLAND 20814-2797

REPLY TO
ATTENTION OF:

CSCA-SP 07 DEC 1984

SUBJECT: Utilization of Increased Airlift Capability (UIAC) Study

Deputy Chief of Staff for Logistics
Department of the Army
ATTN: DALO-TSP
Washington, DC 20310

1. Reference letter, DALO-TSP, HQDA, 19 April 1984, subject as above.

2. The Deputy Chief of Staff for Logistics requested that the US Army Concepts Analysis Agency (CAA) conduct a study to determine the impact of increases in peacetime airlift capacity and develop a process that could be employed to select the most suitable cargo and route combinations to utilize the additional capacity.

3. This report identifies the potential increase in peacetime airlift capacity available to the Army during FY 84-89 and addresses the impacts of additional airlift capacity on the Army's transportation system. The report also describes a methodology for analyzing transportation alternatives to use the additional capacity. Finally, the report recommends a resupply transportation alternative that should result in substantial cost avoidance for the Army.

1 Incl
as

E. B. Vandiver III

E. B. VANDIVER III
Director

CAA

UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC) STUDY

STUDY SUMMARY CAA-SR-84-29

THE REASONS FOR PERFORMING THE STUDY were to determine the Army's allocation of unsubscribed capacity, and develop a process to assist the sponsor is selecting the most suitable cargo and route combinations to utilize the Army's allocation.

THE PRINCIPAL FINDINGS of this study are:

(1) The Military Airlift Command's (MAC) flying hour program and scheduled procurement of new aircraft are the major determinants in identifying air routes with additional or unsubscribed capacity.

(2) The Army's projected allocation of unsubscribed capacity is 55 percent of the total amount available.

(3) MAC's proposed Airlift Service Industrial Fund (ASIF) incentive tariff rate favors diverting Army-sponsored cargo packed at seaport terminals to realize transportation cost avoidances.

(4) Sufficient amounts of air eligible port-packed cargo to fill the Army's projected allocation of unsubscribed capacity will not be available beyond FY 86.

(5) Significant increases in forecasted amounts of unsubscribed capacity suggest the Army reconsider utilizing its allocation for airlift resupply.

THE MAIN ASSUMPTIONS upon which this study is based are:

(1) Increases in unsubscribed capacity detailed in MAC's study, "Airlift Management in a New Era," are accurate.

(2) Peacetime airlift commitments from the Civil Reserve Air Fleet (CRAF) will be retained and increased commensurate with increases in MAC fleet capability.

(3) Proposed ASIF tariff changes will be implemented.

(4) Projected increases in unsubscribed capacity will not be assigned in support of Joint Chiefs of Staff (JCS) exercises.

THE PRINCIPAL LIMITATION of the work which might affect the findings is that the historical lift data extracted from MAC, the Military Sealift Command (MSC), and Military Traffic Management Command (MTMC) records could not be validated by Army sources.

THE SCOPE OF THE STUDY includes an examination of the Army's requirement for over-ocean movement of Army-sponsored cargo in the 1984-1989 timeframe, and the development of a process to select the cargo route combinations best suited to use the additional airlift capacity.

THE STUDY OBJECTIVES were:

(1) Identify the range of unsubscribed airlift capacity that will be made available to the Army.

(2) Develop criteria for the selection of cargo categories suitable for airlift.

(3) Identify the data that affect the selection of cargo and route combinations most suitable for airlift.

(4) Develop and document a cargo and route selection process for use by the sponsor.

THE BASIC APPROACH followed in this study was to define the Army transportation requirements for sealift and airlift, determine the Army's allocation of unsubscribed capacity, and then develop a methodology to assist the sponsor in selecting the most suitable cargoes and air routes to utilize the Army's capacity allocation. Historical lift data detailing Army peacetime cargo movements were then collected to facilitate the selection of air-eligible surface cargoes for diversion and, finally, the transportation cost avoidances resulting from the diversion were computed.

THE STUDY SPONSOR was the Deputy Chief of Staff for Logistics who sponsored the work, established the objectives, and monitored the study activities.

THE STUDY EFFORT was directed by CPT(P) Jeffrey A. Sorenson, Strategy, Concepts and Plans Directorate.

COMMENTS AND QUESTIONS may be sent to the US Army Concepts Analysis Agency, ATTN: Assistant Director for Strategy, Concepts and Plans, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

Tear-out copies of this synopsis are at back cover.

CONTENTS

FIGURES

TABLES

UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC)

CHAPTER 1

INTRODUCTION

1-1. INTRODUCTION. Air transport of peacetime cargo currently comprises 9 percent of all over-ocean cargo moved within the Defense Transportation System. Future procurement of additional airlift resources could increase peacetime airlift capacity to 12 percent of over-ocean cargo shipments. Planning for and use of the additional airlift capacity requires that the Army identify the most appropriate routes and cargo types for diverting cargo from sealift to airlift. The impacts of additional airlift capacity on the current Army transportation system are unknown. Consequently, the Deputy Chief of Staff for Logistics (DCSLOG), Headquarters, Department of the Army (HQDA), tasked the US Army Concepts Analysis Agency (CAA) to study the impact of increases in peacetime airlift capacity and to report the study findings in September 1984. This report discusses the study approach, the reasons for the increase in airlift capacity, the impacts on the current Army transportation system, and an approach to exploit the additional airlift capacity.

1-2. BACKGROUND. The Military Airlift Command (MAC) has embarked upon a fleet expansion program to satisfy wartime contingency airlift requirements. Because of the fleet expansion, MAC's peacetime airlift capacity will increase by 50 percent by FY 1989. This dramatic increase in peacetime airlift capacity, in contrast to the minimal increases in demand for airlift by the Services, will require the Army to adjust its use of peacetime transportation resources. The adjustment will impact on the Army's current use of sealift, forecasting and budgeting of airlift, and movement of airlift cargo.

1-3. PURPOSE AND SCOPE. This study develops a process to select the cargo and route combinations best suited to use the additional airlift capacity. The primary focus of the study was Army-sponsored cargo requirements for FY 1984-1989.

1-4. OBJECTIVES

a. Determine the amount of additional airlift capacity that will be made available to the Army.

b. Develop and document a process to be used by the sponsor in selecting cargo and route combinations to use the additional airlift capacity.

1-5. LIMITATION. Historical surface lift data from the Military Sealift Command (MSC) and Military Traffic Management Command (MTMC) and airlift data from MAC could not be validated by Army sources.

1-6. ASSUMPTIONS

a. The projections of additional capacity made by the MAC are accurate.

b. Joint Chiefs of Staff (JCS) will not use the additional capacity for field training exercises (REFORGER, BOLD EAGLE, etc.).

1-7. ESSENTIAL ELEMENTS OF ANALYSIS (EEA). The essential elements of analysis of the study were designed to examine the impacts of additional airlift capacity on the Army peacetime transportation system, and to identify potential solutions to the problem. These elements were as follows:

a. What specific airlift channels and sealift routes will be affected by the need to utilize additional airlift capacity?

b. What types and sizes of cargo are most appropriate to be reprogramed from the sealift shipment mode to the airlift shipment mode?

c. If the proposed Airlift Service Industrial Fund (ASIF) is implemented, how will it alter the selection process for reprograming cargo for airlift in (b) above?

d. How and to what extent does the cargo selection process help traffic managers identify what cargo categories should be diverted from sealift to airlift?

1-8. STUDY PLAN. The plan to complete this study is depicted in Figure 1-1.

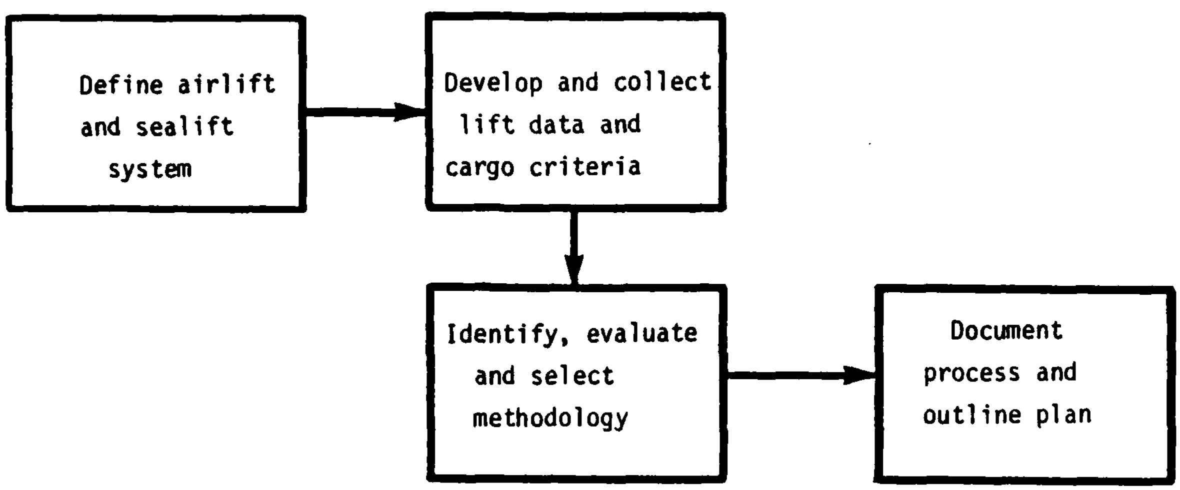


Figure 1-1. Study Plan

a. The following activities were necessary to define the airlift and sealift system:

(1) Research JCS publications, MSC, MAC, and MTMC directives; and Army, Navy, and Air Force regulations related to the movement of Army-sponsored, over-ocean cargoes.

(2) Analyze and evaluate the operations and procedures used by MAC, MTMC, and MSC to move cargo and establish transportation rates.

(3) Research completed and on-going studies related to the use of airlift to transport cargo.

(4) Determine the amount of added airlift capacity available for Army use.

b. The following actions were required to develop cargo selection criteria and analyze cargo lift data:

(1) Identify cargo lift data bases which most accurately reflect over-ocean movements of all types of Army-sponsored cargo.

(2) Investigate transportation studies and interview transportation personnel to identify pertinent criteria for selecting cargo types for airlift.

(3) Establish procedures to build and maintain a cargo lift data base for future analysis.

c. The identification, evaluation, and selection of an appropriate methodology required the following:

(1) Identifying alternative transportation models employed to solve transportation problems.

(2) Evaluating the applicability of these models to the additional airlift problem.

(3) Selecting the most appropriate modeling technique, based upon available cargo lift data and the processing constraints of potential model users.

d. The following actions were required to document the process and outline the plan:

(1) Document the process so that the user can replicate the analysis steps, since data inputs may change on an annual basis.

(2) Prepare an illustrative example of the process to detail the required inputs, the cargo and route selection process, and the related outputs.

(3) Identify actions required to fully implement the selected process.

CHAPTER 2

MILITARY AIRLIFT COMMAND (MAC) INCREASE IN PEACETIME AIRLIFT CAPACITY (1984-1989)

2-1. INTRODUCTION. MAC has embarked upon a fleet expansion program to satisfy the projected wartime lift requirements of a global scenario. This chapter describes the goals of the fleet expansion, MAC's flying hour training program, additional peacetime airlift capacity or unsubscribed airlift capacity and the incentive tariff airlift rate.

2-2. MAC'S CARGO FLEET EXPANSION

a. Department of Defense (DOD) Directive 5160.2, Single Management Assignment for Airlift Service, assigns MAC the mission of ensuring that sufficient airlift capacity is available to satisfy the wartime and contingency requirements of DOD. MAC accomplishes this mission through aircraft procurement programs and by requiring high standards of aircrew readiness.

b. In 1980, the Congressionally Mandated Mobility Study (CMMS) analyzed the wartime use of sealift and airlift resources, and prepositioning of materiel and equipment to satisfy logistic requirements of a global scenario. The results of the CMMS recommended that wartime airlift capacity be increased to 66 million ton miles/day (MTM/D) to satisfy the airlift requirements of the scenario. Since the study results indicated available airlift capacity was 64 percent below the recommended amount, MAC embarked upon a fleet expansion program to increase the physical cargo capacity of their fleet.

c. The FY 85-89 Defense Guidance established 58 MTM/D (see Figure 2-1) as an interim goal toward achieving the recommended capacity level of 66 MTM/D. The increase in capacity will be provided by the addition of 44 C-5B aircraft, and 19 CRAF-enhanced aircraft. Also, 41 KC-10 aircraft which perform air refueling missions for the Strategic Air Command will be available for cargo movement. Achievement of the 66 MTM/D goal will not be attained until the FY 94-96 timeframe.

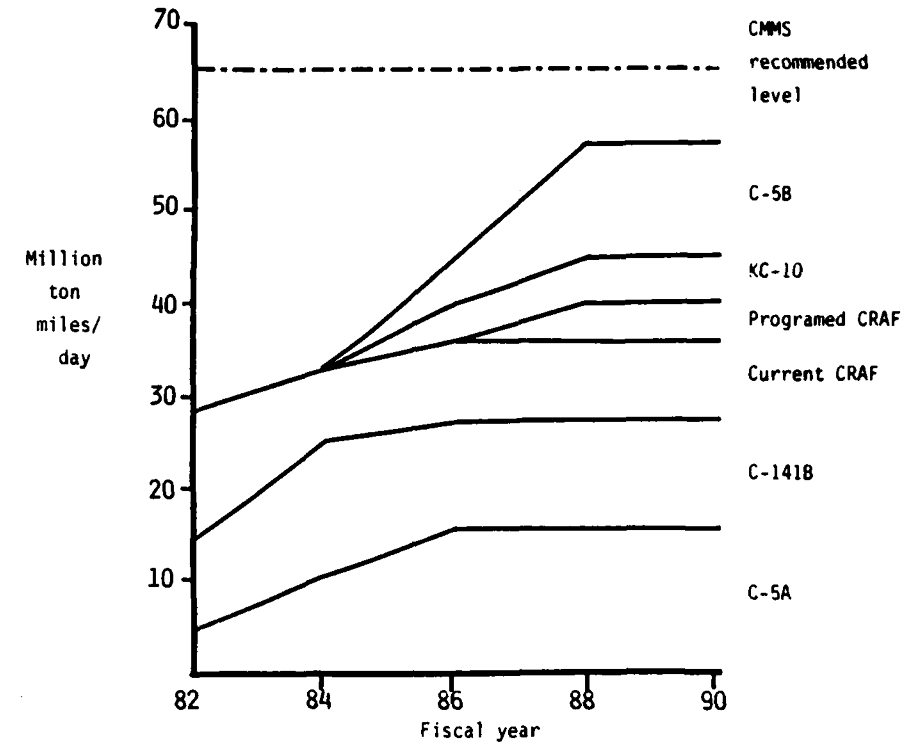


Figure 2-1. MAC Fleet Expansion (FY 82-90)

2-3. MAC'S FLYING HOUR PROGRAM

a. MAC's flying hour program is established as a training program to ensure airlift systems are ready to meet wartime contingencies. The number of hours in the flying hour program differs for each type of aircraft and is based upon four interdependent requirements.[1]

(1) Flying squadrons must train aircrews to be ready for wartime.

(2) Maintenance units must maintain their technical proficiency through "hands on" training.

(3) Supply units require enough flying hours to maintain adequate repair part stockage levels.

(4) Aerial port units must train personnel in cargo and passenger handling.

b. Of the four requirements, satisfaction of aircrew readiness is the dominant factor in the current flying hour program. Historical analysis has shown that satisfaction of air crew requirements also satisfies the maintenance, supply, and aerial port training requirements as well. To derive aircrew readiness, the Air Force considers three factors:

(1) Flying hours for training events, i.e., landings, takeoffs, and approaches.

(2) Flying hours required to upgrade copilots to aircraft commanders.

(3) Flying hours needed for pilots to meet the experience standards of the rated aircrew management (RAM) system.[1]

These factors are then analyzed for each type of aircraft system, and the one factor that requires the most hours establishes the minimum number of flying hours for that airlift system.[1] No one factor dominates the others for all aircraft systems. For example, RAM requirements are the most dominant factor for the C-130 aircraft system. If C-130 pilots fly enough hours to satisfy RAM requirements, the copilot upgrade and training event requirements are also satisfied. For the C-141 and C-5A aircraft systems, upgrade requirements, and training events, respectively, are the dominate factors. Once the dominate factor is established, the number of hours for that factor are multiplied by the number of pilots who fly that aircraft system to derive the minimum number of flying hours for that aircraft system. Table 2-1 depicts the results of these calculations for the respective aircraft systems for FY 84-89. As indicated, the increase in flying hours over the next 5 years is only 6 percent as compared to the 50 percent increase in peacetime fleet capacity. Increases in aircraft cargo space (e.g., C-5A/B versus C-141) primarily account for the significant increase in overall fleet capacity.

Table 2-1. MAC's Flying Hour Program (FY 84-89)

Aircraft	FY 84	FY 85	FY 86	FY 87	FY 88	FY 89	Percent change increase/decrease
C-5A[a]	54,192	54,252	54,072	53,887	53,747	53,747	(1)
C-5B[a]	-	-	1,981	7,765	17,758	28,961	1,360
C-130	156,688	159,528	160,997	161,099	161,099	161,099	(3)
C-141[a]	275,797	274,458	270,807	273,009	273,014	273,014	(1)
	486,677	488,238	487,257	495,760	505,528	516,821	6

[a]Includes Reserve Associate Program.

c. After the total number of flying hours are determined, they are distributed to the respective Services based upon their forecasts and historical needs. Typically, 50 percent of the flying hours are employed to satisfy user cargo lift requirements on channel missions (paragraph 3-2a, Chapter 3).[1]

2-4. UNSUBSCRIBED AIRLIFT CAPACITY

a. A by-product of MAC's flying hour program is available airlift capacity to satisfy peacetime transportation requirements of DOD. Over the next 5 years, the amount of peacetime airlift capacity will increase by 50 percent. Again, this is primarily due to the procurement of larger aircraft for the fleet and not additional flying hours. However, MAC's analysis of historical lift data indicated that user lift needs grew at an annual rate of 2 percent.[2] Assuming that the user growth rate would remain constant and that fleet procurement programs would remain on schedule, MAC projected amounts of unfilled or additional peacetime airlift capacity.

b. To MAC, the unfilled available capacity represents a potential loss of Airlift Service Industrial Fund (ASIF) revenues. ASIF revenues are intergovernmental transfers of funds paid by the users of MAC's airlift resources for air transportation of their cargo. Therefore, MAC decided to describe the unfilled as unsubscribed capacity. Unsubscribed capacity is defined as that amount of airlift capacity generated by the future flying hour program that is not supported by ASIF revenues. Table 2-2 depicts MAC's projection of unsubscribed capacity for FY 84-89.[2]

Table 2-2. Unsubscribed Airlift Capacity (FY 84-89)

FY	Outbound Capacity (STON)			Inbound capacity (STON)	Total capacity (STON)
	Atlantic	Pacific	Total		
84	5,600	2,500	8,100	8,100	16,200
85	6,700	2,900	9,600	9,600	19,200
86	11,700	5,100	16,800	16,800	33,600
87	22,700	9,800	32,500	32,500	65,000
88	29,000	12,500	41,500	41,500	83,000
89	35,000	15,000	50,000	50,000	100,000

c. Currently, ASIF revenues comprise 36 percent of MAC's total budget. The flying hour program is an Air Force budget item that is funded by a combination of Air Force Operations & Maintenance (O&M) funds and cargo lift rates charged to users of the airlift system. Increases in the number of aircraft in the fleet will increase the cost base of MAC's budget because of additional maintenance and fuel costs; however, projected increases in user demand of air cargo transportation will not be enough to fund the additional costs. Thus, the resulting shortfall must either be funded entirely by Air Force O&M funds or be partially offset by increases in MAC's revenue base.

2-5. INCENTIVE TARIFF AIRLIFT CARGO RATE

a. MAC's initial proposal to resolve the unsubscribed capacity problem required that the transportation budgets of the respective Services be increased. Basically, MAC wanted the additional capacity to be considered as part of the total available airlift offered to the Services for air cargo transportation. Although this proposal would have retained the economic value mechanism of airlift allocation (i.e., the cost of airlift regulates its use), it would have increased the bottom line of Service budgets due to "inflated" transportation costs.

b. Another approach was to reduce the airlift rate in order to encourage additional use of available airlift resources. The reduced rate, known as TP-4 (Transportation Priority 4), is a surface equivalent air rate that is based on the current MSC container rate for a surface route that parallels a given air channel. The formula for computing the TP-4 rate is as follows:

MSC container rate for parallel surface route
(MSC COMSCINST 7600.3G, General Cargo Category)

\+

1/3 MTMC packing rate at port
(MTMC Circular 55-83-3, Table 4, CONEX packing)

\+

MTMC documentation rate
(MTMC Circular 55-83-3, Table 2)

=

Total TP-4 cost for airlift channel

The total cost is then divided by 40 to obtain a price in terms of $/cubic foot.

If an MSC container route is unavailable for the parallel air channel, the TP-4 rate is based upon the MSC breakbulk rates as follows:

MSC breakbulk rate for parallel surface route
(MSC COMSCINST 7600.3G, General Cargo Category)

+

MTMC documentation rate
(MTMC Circular 55-83-3, Table 2)

=

Total TP-4 cost for air channel

Again, the total cost is divided by 40 to derive a $/cubic foot rate.

c. Allocating unsubscribed cargo space to the Services is one of the major problems with implementing a TP-4 program. Given that the TP-4 rate is a surface equivalent rate, the allocation of air capacity using an economic value mechanism is not valid. Traffic managers are not discouraged from using airlift because the airlift and surface rates are almost identical. Since airlift will get the cargo to its destination quicker than sealift, airlift demand would increase significantly. Therefore, available cargo space must be allocated on a pro rata basis rather than an economic basis.

d. Although it costs less to transport air cargo in a TP-4 mode, it also takes more time for TP-4 cargo to be delivered to its final destination than higher priority air cargo. TP-4 cargo service is designed to air transport nonair-eligible cargoes normally moved by surface during periods when MAC capacity exceeds user airlift needs. TP-4 cargo can be thought of as deferred air cargo or space available cargo. It is transported if the other higher priority cargoes, i.e., TP-1 through TP-3, do not fill the available airlift space. Since higher priority cargoes generally fill available airlift cargo space, TP-4 air cargo will be delayed at the aerial port until unfilled cargo space becomes available. However, MAC is required to move the TP-4 cargo as quickly as possible while ensuring that time standards for surface movement of TP-3 cargo are not exceeded.

CHAPTER 3

ARMY AIRLIFT TRANSPORTATION SYSTEM

3-1. INTRODUCTION. The Army's use of airlift to transport cargo is governed by DOD Regulation 4500.32R, JCS Publication 15, AR 59-3, AR 59-8, and several MAC and MTMC directives. This chapter defines the regulatory basis for selecting and transporting air eligible cargo, the Army's use of airlift, and the impact of additional airlift on the Army transportation system.

3-2. THE REGULATORY AIRLIFT SYSTEM

a. DOD Reg 4500.32R, Military Standard Transportation and Movement Procedures (MILSTAMP), contains approved joint transportation procedures applicable to the use of airlift for transporting cargo.

(1) Specifically, the chapter on Shipment Clearance discusses required procedures to clear cargo into the Defense Transportation System (DTS). If cargo is to be nominated for airlift it must be cleared through an Air Clearance Authority (ACA) as follows:

(a) First, shipping activities submit a Transportation Control and Movement Document (TCMD) containing cargo data for export shipment to the ACA.

(b) After the ACA has received the TCMD, the shipping activity will release the shipment for movement to the APOE if the ACA does not challenge the shipment by the hour/day indicated in the TCMD day shipped field.

(c) Finally, the ACA will furnish air terminal operators with a completed TCMD for shipment of the item.

(2) The Shipping Activity Requirements Chapter addresses the establishment of airlift requirements and transportation priorities for the services.

(a) Airlift requirements fall into two categories. They are:

1. Air channel - common user airlift provided on a scheduled basis between two points.

2. Special Assignment Airlift Mission (SAAM) - airlift requirements which require special consideration due to the size of cargo, urgency of movement or other factors that may preclude the use of air channel capacity.

(b) Transportation Priorities (TP) fall primarily into four categories, TP-1 through TP-4. Categories TP-1 through TP-3 reflect the importance of materiel needed by the requisitioning activity. TP-1 and TP-2 cargoes normally are transported via airlift, and TP-3 cargoes are

usually transported via surface lift. TP-4 cargo is defined as non-air eligible cargo normally moved by surface means but offered as airlift cargo to fill uncommitted or unsubscribed MAC capacity.

b. JCS Publication 15, Mobility System Policies, Procedures and Considerations, prescribes procedures for submitting common user air transportation requirements and determining the precedence of traffic movement. The chapter on Transportation, Requirements, Allocations, and Priorities discusses the submission of forecast requirements to establish an air channel or to request a SAAM.

(1) The preliminary air channel forecasts are submitted on 1 November for the fiscal year that begins 23 months later, i.e., the request submitted on 1 November 1984 would be for FY 87.

(2) An update of the air channel forecast is submitted on 1 July for the fiscal year that begins 15 months later, i.e., the update that would be submitted on 1 July 1985 is the update for FY 87.

(3) SAAM requests are submitted for air transportation requirements that cannot be satisfied by air channel missions. Requests are submitted as airlift requirements develop and are handled by MAC on an individual basis.

This chapter also discusses the criteria used to assign the TP categories. These criteria distinguish between the missions of the units that receive the materiel and the importance of materiel requested.

c. AR 59-3, Air Transportation, prescribes the use of airlift to transport Army sponsored cargo from CONUS to overseas destinations.

(1) The responsibilities for implementing AR 59-3 are defined as follows:

(a) The Director of Transportation, Energy and Troop Support, ODCSLOG, will provide policy and guidance on the use of airlift services.

(b) The US Army Materiel Command's (AMC) Logistic Control Activity (LAC) will operate the Army ACA (AACA) which verifies, clears and monitors movement control of air cargo.

(c) The Shipper Service Control Offices (SSCO) will verify the need for air movement of cargo.

(d) Installation transportation officers will nominate air elgible cargo for air movement and ship materiel as directed by the SSCO/AACA.

(2) The procedures and criteria used by AACA to clear cargo into the airlift system are depicted in Figure 3-1.

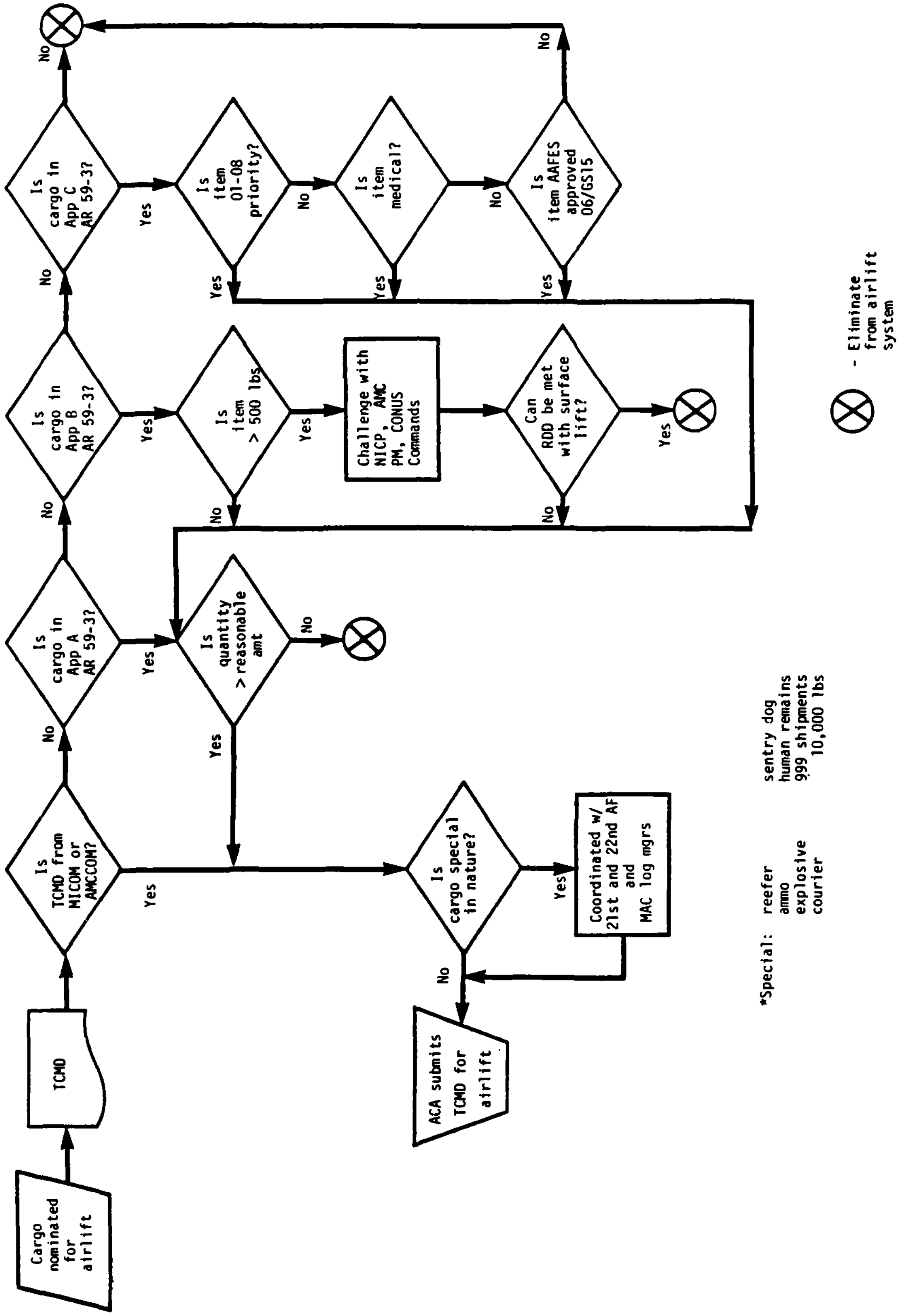


Figure 3-1. AACA Cargo Challenge System

d. AR 59-8, Military Aircraft, implements JCS Pub 15 within the Army. It identifies the procedures to follow to establish MAC air channel service for movement of Army cargo. AR 59-8 defines two types of channel services for movement of air cargo. Requirements channels are established to support movement of air cargo as the cargo materializes. Frequency channels are established for routine air traffic service on a scheduled basis, i.e., two times a week, four times a week, etc. Cargo requirements are not the only consideration for establishing frequency channels. Morale support and operational considerations are sufficient for a service to establish a frequency channel. Frequency and requirement channel listings and cargo rates are not published in the regulation because both items change annually.

(1) Current listings of MAC channels can be obtained from HQ USAF/LET, Washington D.C.

(2) Current cargo rates are published in Air Force Regulation 76-11.

Finally, AR 59-8 prescribes the procedures to be implemented to forecast Army requirements for MAC channel service.

3-3. ARMY USES OF AIRLIFT TRANSPORTATION

a. Analysis of historical airlift data indicated that 30 percent of MAC's total lift capacity was dedicated to move Army-sponsored cargo. Included in this percentage are the Army's requirements for movement of personnel and cargo and airlift support of Army military exercises. Thirty percent of the Army's cargo requirements are Air Line of Communication (ALOC) shipments which enhance the peacetime readiness of Army units.

b. ALOC is a subset of the Army's Direct Support System (DSS). The principal concept of DSS is the elimination of unnecessary intermediaries between the requisitioning unit at the General Support (GS) or Direct Support (DS) level and the CONUS depots. The elimination of intermediaries can occur in the requisitioning or the delivery of select supply items. For example, a unit may request an item directly from a CONUS depot without waiting for the requisition to pass through the DS and GS levels. Similiarly, the item may be shipped directly to the requisitioning unit rather than shipping the item to a GS unit that passes the item through the lower supply levels, and finally, to the requisitioning unit. Significant cost savings through consolidation of inventories at CONUS depots, and improved responsiveness of the supply system were the major benefits realized by the Army as a result of implementing DSS.

c. ALOC improves the responsiveness of DSS by reducing the order-ship-time (OST) of selected Class II and IX items for units overseas. As depicted in Figure 3-2, OST is a segment of the overall inventory pipeline. As OST is reduced, the amount of inventory in the pipeline decreases, and a one-time cost savings results. In addition to cost savings, ALOC has significantly contributed to the streamlining of the Army's logistics structure and operations.

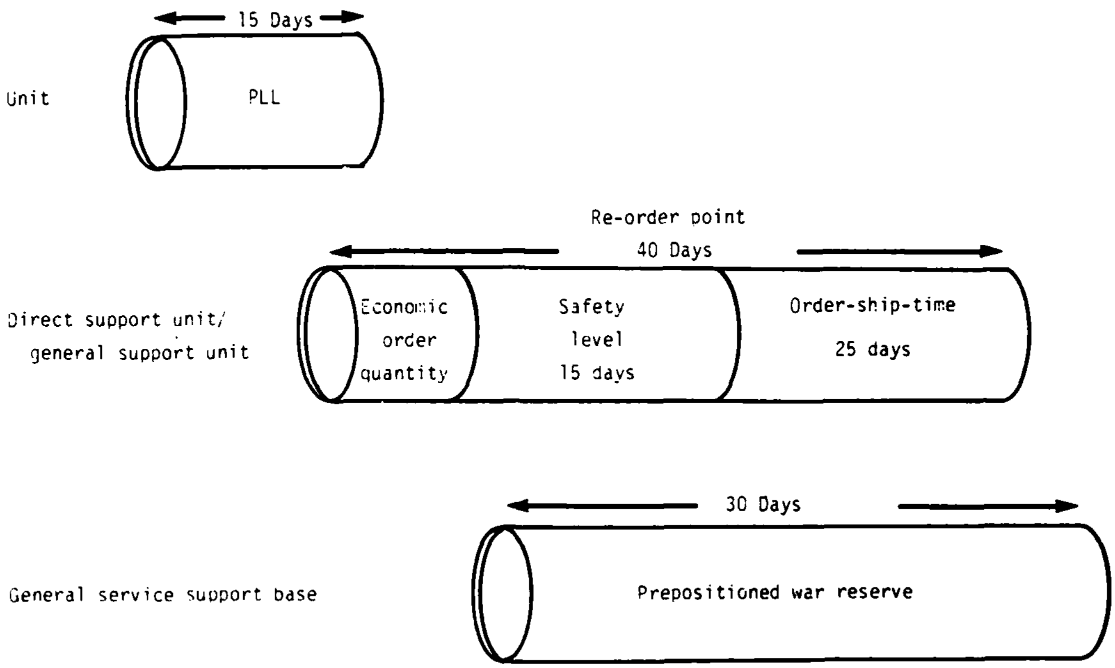


Figure 3-2. Overseas Stockage Policy

d. Currently, the Army has established nine ALOCs around the world. Table 3-1 depicts the amount of cargo delivered to the various ALOC units during FY 83 in order of weight delivered. The Panama and Okinawa ALOCs were established during FY 83, and the amounts shown in the table for these ALOCs do not reflect 12 months of cargo shipments. The Okinawa total reflects 4 months of data, and the Panama total reflects 2 months of data.

Table 3-1. FY 83 ALOC Shipments

ALOC	Weight (STON)	Percent total
Europe	23,826	75.5
Korea	3,173	10.0
Europe (medical)	2,307	7.3
Hawaii	979	3.1
Korea (medical)	586	1.9
Alaska	430	1.4
Japan	139	.4
Panama	72	.2
Okinawa	63	.2
Total	31,575	100

3-4. IMPACT OF ADDITIONAL AIRLIFT ON ARMY TRANSPORTATION SYSTEM

a. If the unsubscribed airlift capacity offered by MAC is used by the Army, three areas of the Army's transportation system will be affected: (1) cargo lift modes, (2) Second Destination Transportation Funds, and (3) Army organic transportation resources.

b. The Army can fill unsubscribed airlift capacity either by increasing its future need for airlift or by diverting cargo currently transported by surface lift to airlift. The fielding of force modernization items will increase the need for transportation of Army-sponsored cargo in the future. However, the majority of these items will be delivered by surface mode because of equipment size constraints. Therefore, increased demand for airlift transportation of force modernization items will be minimal. The integration of force modernization items into the Army inventory will probably increase the number of line items in the ALOC resupply pipelines as more units began to use their new equipment. However, increased demand for ALOC resupply of force modernization items will not provide enough air cargo to fill the Army's allocation of unsubscribed capacity. Thus, the Army's allocation of unsubscribed capacity will most likely be filled by diverting cargo currently transported by surface lift to airlift.

c. The Army's use of additional airlift will require slight adjustments to the current process of budgeting and forecasting for Second Destination Transportation Funds. Figure 3-3 depicts a comparison of airlift and surface forecasting and budgeting for FY 86. As illustrated, airlift forecasts are required before surface forecasts. If the Army decides to fill its allocation of unsubscribed capacity, their annual airlift forecast should be increased to include the allocation. Also, the surface forecast should be decreased to reflect the amount of cargo diverted from surface lift to fill the Army's allocation of unsubscribed capacity. The adjustments to the surface and air forecasts are essential for development of reasonable air and surface cargo rates for each fiscal year. For example, if the surface forecast is not adjusted, the actual cargo amount lifted during the fiscal year will be under-forecasted. As a result, the MSC industrial fund will incur losses due to under utilization, and surface rates will increase in the next fiscal year to offset the losses.

d. The additional use of available unsubscribed airlift will increase the workload of organic Army transportation resources that transport cargo from an aerial port of debarkation (APOD) to its final destination or breakbulk or distribution point. In contrast to sealift which is normally delivered by commercial carriers, Army transportation resources are the primary means of transporting cargo arriving at APODs to their final destination. Initially, the workload increase will be minimal. However, if projected increases of additional capacity are correct, future demand on Army transportation resources could be significant. For example, by FY 89, the workload of the 4th Transportation Command which land transports Army air cargo arriving in Germany could increase by an additional 16,800 STON/year (see Chapter 5, Tables 5-3 and 5-4).

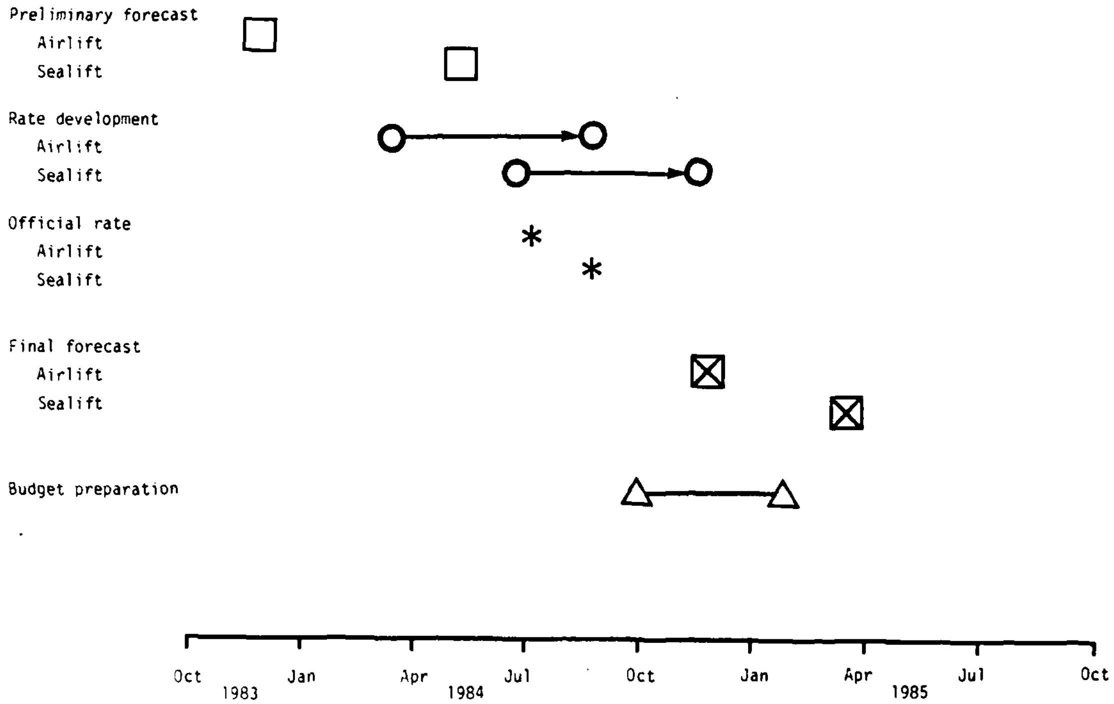


Figure 3-3. FY 86 Second Destination Transportation Funding Process

CHAPTER 4

OTHER STUDIES ON AIRLIFT UTILIZATION

4-1. INTRODUCTION. During the course of the UIAC study, several related studies and reports were reviewed. The purpose of the review was to analyze approaches to similar problems and to examine their data. In fact, a similar problem of additional peacetime airlift capacity to transport cargo evolved following the end of the Vietnam conflict. Many studies were conducted to resolve that problem, and the results of those studies formed the basis for establishing the Army's current ALOC system. The initial study on this problem was the Routine Economic Airlift (REAL) Study conducted by the Research Analysis Corporation (now General Research Corporation). The Joint Services Air Logistic Pipeline (ALP) Study followed and investigated the use of airlift to improve the supply pipelines of the services. The Army responded to the ALP Study by initiating an ALOC to Europe which was evaluated by the US Army Material Systems Analysis Activity (USAMSAA) in their analysis of ALOC-Europe study. A MAC study entitled Airlift Management in a New Era is a recent study regarding the current problem, and details the impacts of MAC's fleet expansion on future amounts of peacetime cargo capacity.

4-2. REAL STUDY. The REAL concept was developed for the Army in 1969. In that concept, selected high dollar value items were identified for routine delivery by air.[7] In theory, the reduced order-ship-time (OST) resulting from air cargo delivery would more than offset the increased transportation costs of air shipment. However, due to supply implementation problems, as well as questionable cost avoidance results, the program was not successful, and was disbanded. The concept of realizing inventory cost avoidances through pipeline reduction was valid, but the item selection process failed to take into account normal Army resupply procedures.

4-3. ALP STUDY. The ALP Study was a joint service study to determine what DOD cargo should be moved by air, and the resulting potential savings.[8] The Army's response to the ALP Study recommended a test of an ALOC concept in conjunction with the Modernization of Logistics (MODLOG) program announced in 1975. The major objectives of the MODLOG program were to optimize the logistics structure and operations; to increase reliance on CONUS support; and to increase host nation support. ALOC supported the MODLOG effort by providing a quick response logistic system which resulted in phasing down the USAREUR depot system, and realizing significant cost avoidances through inventory reductions. Based upon the ALP Study, an ALOC for Europe was established in 1977. Successful implementation of the ALOC in Europe formed the basis for establishing ALOCs in other parts of the world (paragraph 3-3d).

4-4. ANALYSIS OF ALOC-EUROPE STUDY. The title of the technical report, Analysis of ALOC-Europe (ALOC-E) Order-Ship-Time Segments for Effects on Materiel Management, System Cost and Operational Readiness, describes the purpose of the study. USAMSAA's report evaluated the procedures used in processing Class IX requisitions for Europe since the implementation of ALOC-E in 1977.[9] One of the study findings noted that the Standard Army Supply System uses the unit priority designator to determine an item's mode of shipment, and not the item's air eligibility code (AEC) which was established to support ALOC. Overall analysis of the eleven time segments which comprise OST, resulted in extending the original ALOC management goal of cargo delivery to Europe from 20 days to 23 days. Overall, the study provided an in-depth analysis of ALOC during peacetime and its impact on improved logistic support.

4-5. AIRLIFT MANAGEMENT IN A NEW ERA STUDY. This study, produced by MAC in 1983, discusses the impacts of additional peacetime airlift capacity that could be made available given MAC's fleet expansion and the projected peacetime lift needs of the Services.[2] Cargo selection criteria for utilizing the additional airlift criteria focused on the concept of airlift dependency during peacetime. Since the additional capacity would be primarily committed to movement of equipment and personnel during wartime, the study cautioned against undue reliance on inflated increases in peacetime airlift capacity levels. Other selection criteria recommended included: improvement of morale support, acceptance with the common user system, and improvement of force readiness. Also, to offset potential losses of ASIF revenues, the study recommended an incentive tariff to funnel additional cargo into the airlift system.

4-6. SUMMARY. Overall, the previous studies recommended using available airlift to realize pipeline inventory savings. However, based upon increases in ALOC transportation costs and MAC's caution against undue reliance on available peacetime airlift capacity, the original focus of this study was not to consider increasing use of airlift resupply. Instead, the focus of the UIAC Study was to determine other ways to achieve cost effective use of available airlift capacity. Chapter 6 discusses alternative ways for the Army to fill the additional capacity based upon changes in the study scope as a result of recent MAC initiatives (Chapter 5).

CHAPTER 5

PROBLEM DEVELOPMENT

5-1. INTRODUCTION. Because of uncertainty regarding future amounts of unsubscribed capacity, the problem analyzed in this study has been and will continue to be a dynamic problem. This chapter will discuss the dynamics of problem development and the methodologies that were evaluated for application to the problem.

5-2. PROBLEM DEVELOPMENT

a. The scope and nature of the problem have changed considerably since the study began in January 1983. Changes in scope were the result of MAC initiatives which altered the factors under consideration. Table 5-1 illustrates the changes of the study scope as a result of the MAC initiatives. In sum, the MAC initiatives have narrowed the scope of the problem as discussed below.

b. Initially, the purpose of the study was to identify the most suitable cargo and air route combinations for use by the Army (column 1, Table 5-1). Therefore, the study entailed a thorough evaluation of all the air routes used by the Army and the identification of divertible surface cargo types to fill the unsubscribed capacity. When the study began, an estimation of the Army's allocation of unsubscribed capacity was unavailable. However, a previous analysis of Army over-ocean surface lift transportation requirements indicated that 50 percent of all surface cargo lifted by MSC was Army-sponsored cargo. If airlift data indicated a similar usage factor, then the upper bound on the Army's allocation of unsubscribed capacity would probably be 50 percent. Assuming the Army would be allocated 50 percent of the unsubscribed airlift capacity, the Army could fill its allocation by diverting approximately 7 percent of its surface cargo. Cost was still a factor to discriminate between cargo types to be diverted as well as routes to be considered. Also, operational considerations, such as Army lift requirements, influenced the types of cargoes and routes to be selected.

c. The first change in the study scope occurred when a MAC proposal to allocate the additional cargo capacity to the services was rejected. Basically (column 2, Table 5-1), MAC wanted the additional capacity to be included with their present capacity and funded under the current rate structure. This proposal had merit since the economic value of allocating airlift space would be maintained. However, this proposal would have increased the bottom line of the services' peacetime transportation budgets due to "inflated" airlift costs. Since the additional airlift capacity was procured to support wartime, not peacetime, cargo lift requirements, it was decided that the additional costs of expanding the MAC fleet would be primarily funded by Air Force O&M funds. However, to offset some of their additional costs, MAC proposed an incentive tariff TP-4 program. As stated in Chapter 2, the TP-4 rate is primarily a surface equivalent rate. With

the introduction of a TP-4 rate, cargo transporation cost was eliminated as a discriminator of cargo types. Aside from packing and line haul charges, the over-ocean rate for a particular cargo type was identical regardless of the mode of transportation. Thus, cargo cost factors were dropped from consideration (column 2, Table 5-1) as a result of this initiative. Appendix E contains a detailed discussion of the elements of transportation cost.

Table 5-1. UIAC Problem Development

		Original problem	MAC initiates incentive tariff	MAC proposes incentive routes
Route selection	Routes	All	All	Incentive
	Cost factors	X[a]	X	Evaluate
	Operational considerations	X	X	X
Cargo selection	Type	Surface divertible (7.0%)	Surface divertible (7.0%)	Surface divertible (3.5%)
	Cost factors	X		
	Operational considerations	X	X	X

[a]X = to be included in the analysis.

d. The last change in the scope of the study resulted from the Air Force Program Objective Memorandum (POM) released in May 1984 (column 3, Table 5-1). A significant outcome of the POM was the modification of the Active fleet structure. The initial estimate of unsubscribed capacity was forecasted based on the assumption that all newly procured aircraft would be assigned to the Active fleet. The POM directed that some of the newer aircraft be assigned to air wings in the Reserves. Since the Reserves' flying hour program is less demanding than the Active force, the total amount of unsubscribed capacity was reduced. Again, using the same

rationale as above, if the Army was allocated 50 percent of the unsubscribed capacity, the Army could fill its allocation by diverting only 3.5 percent of Army cargo currently transported by surface mode. Additionally, since the POM force structure was defined, MAC could project where the unsubscribed capacity would be made available.

(1) The majority of unsubscribed capacity in future years will be created by the fielding of C-5B aircraft. The results of the POM provided MAC with a projection of the units scheduled to receive the C-5B aircraft system. From this information, MAC determined the routes that would contain unsubscribed capacity and forecasted the amount of unsubscribed capacity for each route. Table 5-2 depicts MAC's projection of unsubscribed capacity for C-5B for FY 86. Also, Table 5-2 illustrates a percentage breakdown of the total capacity which was computed using the midpoints of the capacity data provided by MAC, e.g., Norfolk-Rota/Sigonella, 75 STON/month divided by 1,320 STON/month, equals 5.7 percent.

Table 5-2. Unsubscribed Capacity FY 86

Routes	Capacity (STON/month)	Route capacity as percentage of total available
Norfolk - Rota/Sigonella	70 - 80	5.7
Norfolk - Rota/Bahrain	40 - 80	4.5
Dover - Rhein Main/Ramstein	420 - 460	33.2
Dover - Dhahran	80 - 90	6.4
Dover - Incirlik	100 - 120	8.3
Charleston - Howard	60 - 70	4.9
Travis - Hickam/Guam/Subic/Clark	110 - 130	9.1
Travis - Clark/Diego Garcia	90 - 100	7.5
Travis - Kadena	50 - 70	4.5
Travis - Yokota/Osan	80 - 100	6.8
Travis/Tinker - Europe	110 - 130	9.1
Total	1,210 - 1,430	100

(2) MAC is currently developing an implementation plan to allocate unsubscribed cargo space to the services. Although the plan was not completed at the writing of this report, indications were that the allocation system would be based upon the Services' historical lift needs on the routes described above. Based upon this information, the route data provided in (1) above, and the total projected amount of unsubscribed capacity available to the DOD (Table 2-2), the Army's allocation was derived for each route. First, a historical lift factor was developed for each route. This factor represents the historical amount of Army cargo transported via a particular air route as a percentage of the total amount of cargo transported by MAC on that route. Second, using the route analysis for C-5Bs from Table 5-2, the total amount of unsubscribed capacity per route was derived. For example, the total amount of unsubscribed capacity for FY 84 for the Dover - Rhein Main/Ramstein route was derived as follows: .332 x 8,100 STON/year = 2689.2 STON/year, or approximately 2,690 STON/year. Finally, the Army's historical lift factor (Tables 5-4 and 5-5) was multiplied by the route capacity to derive the Army's projected allocation of unsubscribed space for each route. For example, the Army's FY 84 allocation of unsubscribed capacity for the Dover - Rhein Main/Ramstein route was derived as follows: .96 x 2,690 STON/year = 2,582.4 STON/year, or approximately 2,580 STON/year. Table 5-3 depicts the pro forma unsubscribed capacity allocations for Atlantic routes. Table 5-4 illustrates the same information for Pacific routes and provides a total for all routes.

(3) The Army's projected allocation of unsubscribed capacity equates to about 55 percent of the total unsubscribed capacity available as compared to the Army's historical use of 30 percent of MAC's resources (paragraph 3-3a). The difference stems from the fact that Army cargo is primarily lifted on the routes identified by MAC to contain unsubscribed capacity.

e. It is important to note that the routes and amounts of unsubscribed capacity for each route are subject to change each year depending upon MAC operations. Additionally, the routes proposed by MAC are not without exception. MAC will redistribute the Army's allocation of unsubscribed capacity to other routes nominated by the Army if sufficient airlift requirements exist and MAC operations are not impacted adversely. However, because additional Army airlift requirements were not identified, the study focus narrowed to primarily evaluating what Army cargoes should be diverted from surface to fill the Army's allocation of unsubscribed capacity on the 11 routes proposed by MAC. Other air routes would be evaluated once Army airlift requirements were defined.

Table 5-3. Pro Forma Unsubscribed Capacity per Route (STON) - Atlantic

	Historical lift factor (%)	Eastern Outbound											
		FY 84		FY 85		FY 86		FY 87		FY 88		FY 89	
		Total	Army	Total	Army	Total	Army	Total	Army	Total	Army	Total	Army
Norfolk - Rota/Sigonella	4	460	20	545	20	950	40	1,840	75	2,350	95	2,830	115
Norfolk - Rota/Bahrain	1	365	5	435	5	760	10	1,470	15	1,880	20	2,265	25
Dover - Rhein Main/Ramstein	96	2,690	2,580	3,190	3,060	5,580	5,360	10,790	10,360	13,780	13,230	16,600	15,940
Dover - Dhahran	72	520	375	615	445	1,080	780	2,085	1,500	2,660	1,915	3,210	2,310
Dover - Incirlik	47	670	315	795	375	1,395	655	2,700	1,270	3,445	1,620	4,150	1,950
Charleston - Howard	63	400	250	470	295	825	520	1,595	1,005	2,035	1,280	2,450	1,545
Eastern outbound total		5,105	3,545	6,050	4,200	10,590	7,365	20,480	14,245	26,150	18,160	31,505	21,885

Table 5-4. Pro Forma Unsubscribed Capacity per Route (STON) - Pacific

	Historical lift factor (%)	Western Outbound											
		FY 84		FY 85		FY 86		FY 87		FY 88		FY 89	
		Total	Army	Total	Army	Total	Army	Total	Army	Total	Army	Total	Army
Travis - Hickam/Guam/ Subic/Clark	12	735	90	870	150	1,520	260	2,945	500	3,760	640	4,530	770
Travis - Clark/Diego Garcia	12	610	75	725	90	1,270	155	2,450	295	3,130	375	3,775	455
Travis - Kadena	29	365	105	435	125	760	220	1,470	425	1,880	545	2,265	655
Travis - Yokota/Usan	91	550	500	650	590	1,140	1,040	2,210	2,010	2,820	2,565	3,395	3,090
Travis - Tinker-Europe	19	735	140	870	165	1,520	290	2,945	560	3,760	715	4,530	860
Western outbound total		2,995	910	3,550	1,080	6,210	1,895	12,020	3,655	15,350	4,670	18,495	5,625
Total outbound[a]		8,100	4,455	9,600	5,280	16,800	9,260	32,500	17,900	41,500	22,830	50,000	27,510

[a]Combined total of outbound unsubscribed capacity.

5-3. METHODOLOGY EVALUATION

a. The objective of the methodology evaluation was to find the best methodology for selecting suitable route and cargo combinations to utilize the additional airlift capacity. Other studies (discussed in Chapter 4) as well as mathematical models were examined to identify suitable technique to solve the problem. The transportation aspects of the problem were emphasized during the evaluation.

b. Initial evaluation of the UIAC Study suggested a classical transportation problem approach. Classical transportation methodologies are employed to optimize the distribution of cargo over routes with given physical capacity constraints. The UIAC problem involved a multitude of cargoes with many sources and destinations. However, further analysis indicated that the problem was not a distribution problem. It was not a distribution problem because the Army's transportation cargo lift demand between sources and destinations is currently satisfied by available air and surface resources. Thus, classical transportation methodologies were not suitable for application to this problem.

c. Several multiple objective decisionmaking (MODM) techniques which are mathematical models that help decisionmakers analyze data and develop alternative solutions were evaluated next. Generally, the modeling requirements for employing a MODM technique are similar, and the following discussion of goal programing will detail why a MODM technique was not used. Goal programing is a MODM technique normally employed to optimize a set of decision alternatives; however, there are two reasons goal programing was not employed. First, goal programing is normally employed to design the best alternative to given design constraints. In addition to design constraints, the decisionmaker defines his objectives and identifies quantifiable acceptance levels for each objective. The alternatives are then developed based on the various interactions of the design constraints and the objectives. As stated above, the problem was not to design cargo alternatives, but to select the preferred divertible cargoes from a given set of available surface cargoes. Second, the narrowed focus of the problem did not warrant the development of a complicated goal programing approach. Finally, the surface and air routes are self-contained, therefore, cargoes could not be diverted to alternate ports. Only cargoes on surface routes that paralleled a particular air route could be considered for diversion. Cargoes on other surface routes could not be considered for diversion to that particular air route. Thus, goal programing was not an appropriate technique.

d. As defined above, the problem centered on developing a methodology to prioritize the cargo types that should be diverted from surface shipment to airlift. The most suitable methodology for this requirement was a multiple attribute decisionmaking (MADM) technique. MADM techniques are normally employed when the number of alternatives to evaluate or prioritize are predetermined. In the UIAC Study, the alternatives, i.e, cargo types that are air eligible, are finite in number. Also, each cargo alternative is characterized by a given set of attributes. The attributes may be objective (MAC/MTMC billing data, density data, etc.) or subjective

(operational readiness, effects on transition to war, etc.) in nature. Application of the MADM technique prioritized the alternatives based upon a combination of the importance of the attributes and attribute values for the given alternatives. Chapter 6 discusses the MADM technique that was selected for the UIAC Study.

e. Analysis of historical air and surface data also supported the use of a MADM technique. As indicated in Table 5-5, the projected growth of Army cargo lift requirements is low. During the period FY 81-83, Army surface requirements increased at an annual rate of 1.6 percent and air requirements increased at an annual rate of 2.5 percent. (Note: The Army's annual growth in airlift requirements coincides with MAC's 2 percent annual growth projection). In real terms, the increase in future Army airlift needs equates to an annual increase of approximately 2,300 STON per year. In contrast, by FY 89 about 55,000 STON of airlift capacity is projected as the Army's allocation. Thus, growth of Army cargo airlift requirements will not be enough to fill the Army's allocation of additional air capacity by FY 89. If required to fill the available airlift capacity, the Army must divert additional cargo from sealift to airlift. The selected methodology must be capable of prioritizing cargo types for diversion from sealift to airlift without using cargo cost as a discriminating factor. This methodology will not attempt to change the current MILSTAMP transportation priority system but work within the current system to prioritize cargo types within a given transportation priority.

Table 5-5. Army Transportation Requirements FY 81-83 (000s MTON)

	FY 81	FY 82	FY 83	Average annual growth rate[c]
MSC - Surface	3,633	3,792	3,748	1.5%
MAC - Air[a]	214	223	225	2.5%
ALOC[b]	(76)	(91)	(112)	(21.4%)
Total	3,847	4,015	3,973	

[a]Total airlift includes ALOC totals which are isolated by ( ).

[b]ALOC data reflects actual MTON whereas MAC data is converted using a factor of 2.42 MTON/STON.

[c] $\sqrt{\dfrac{\text{FY 83}}{\text{FY 81}}} - 1$ = average annual growth rate.

CHAPTER 6

METHODOLOGY DEVELOPMENT

6-1. INTRODUCTION. The methodology developed for this study will be discussed in this chapter. The discussion will include an overview of the methodology; a description of the data sources used in the analysis; the route selection process; the identification of air eligible cargo types; an explanation of the model used to prioritize cargo types; and an analysis of surface and air transportation costs.

6-2. OVERVIEW

a. The methodology is depicted in Figure 6-1. Basically, the methodology breaks the analysis into three parts. First, an air route is selected for analysis. Second, surface divertible, air eligible cargo types are identified and prioritized for the air route. Finally, the unsubscribed airlift capacity for the air routes is filled with diverted cargo, and the routes are then ranked based on transportation cost avoidance.

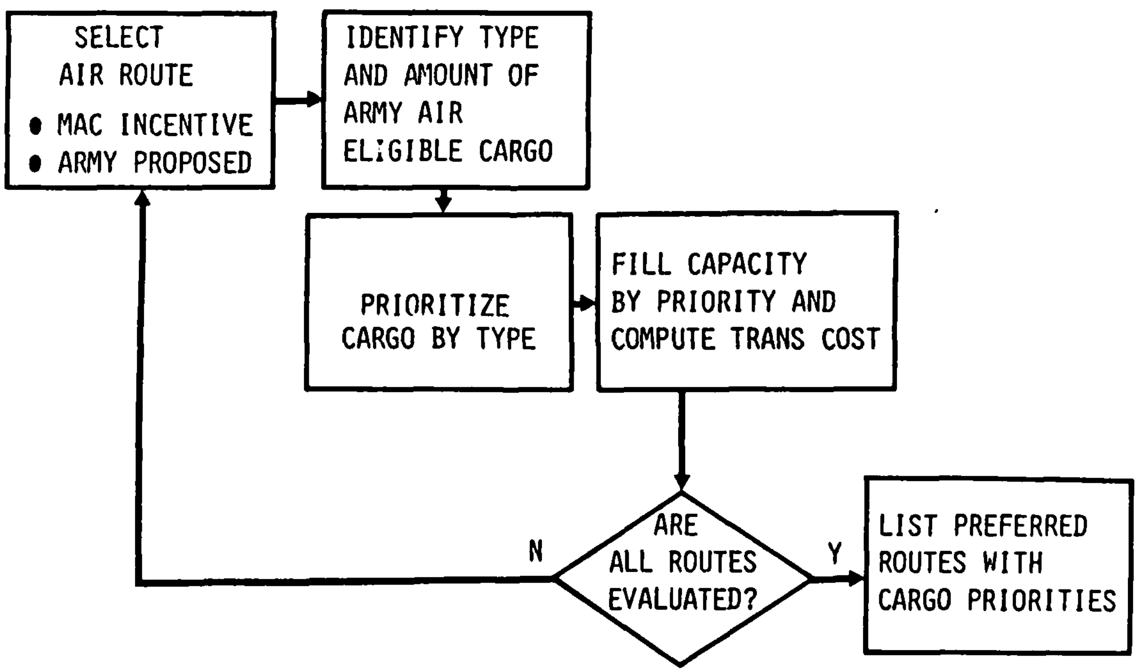


Figure 6-1. UIAC Study Methodology

6-3. DATA DESCRIPTION

a. Data for the UIAC Study were obtained from five different sources.

(1) Surface lift data which details Army shipments of surface cargo were acquired from MSC and MTMC.

(a) Three years of historical lift data were obtained from MSC. The data contained information on the amount of Army cargo shipped by route, commodity, and mode of shipment, i.e., breakbulk or container. All totaled, 424 unique routes that the Army utilized to transport its surface cargo were identified in the data.

(b) One year of historical lift data was obtained from MTMC. These data contained ship manifest information on the amount and type of Army cargo packed at seaport terminals (e.g., Bayonne, Charleston, etc.) for a given route. Army surface cargo types were identified by the three-digit water commodity code in MILSTAMP. Of the 424 routes identified in the MSC data base, 374 were contained in the MTMC data base.

(2) Three years of historical airlift data detailing Army shipment of air cargo were acquired from MAC. The data provided by MAC contained lift information of Army air shipments by commodity, type, and amount. The cargo types were identified by the airlift commodity codes contained in MILSTAMP.

(3) Three years of air challenge data were obtained from AACA. The AACA data detailed the amount of Army cargo nominated for air shipment, challenged, diverted, and the resulting cost avoidance from cargo diversion. Commodity types are not identified in the data. However, ALOC cargo shipments are isolated from the total amount of air cargo nominated and diverted.

(4) Three months of ALOC performance data were obtained from LCA. The ALOC data contained information on time of shipment for each of the 11 segments representing the total OST for airlift movement for each major Army theater. Also, similar performance data were provided for movement of DSS cargo by surface movement.

b. The raw data records from MSC, MTMC, and MAC were transformed into time series data for analysis. Tonnage amounts were segregated by commodity, month, and route. MTMC data were further segregated by MILSTAMP transportation priority. Finally, the raw route data were aggregated by month and listed chronologically for each route by commodity.

6-4. ROUTE SELECTION PROCESS

a. As discussed in paragraph 5-2d, Chapter 5, MAC identified 11 air routes which were projected to contain unsubscribed capacity. The projection was based on the historical cargo lift needs of the Services and cargo lift capacities of aircraft assigned to the aerial ports of

embarkation (APOE). As more aircraft become operational, the amount of MAC's unsubscribed airlift capacity and possibly the routes with unsubscribed capacity will change. The Army can also nominate air routes with valid airlift requirements and redistribute their unsubscribed capacity allocation accordingly. Therefore, MAC proposed air routes or a combination of MAC proposed air routes and Army nominated air routes will be selected for evaluation. Changes in MAC capacity allowances or adjustments in Army airlift requirements will require that the air route selection process be conducted annually.

b. Once an air route is selected, unsubscribed airlift capacities must be defined for each route. Airlift capacities for Army nominated air routes should be determined by ODCSLOG based upon projected Army airlift requirements. MAC will develop unsubscribed airlift capacities for MAC proposed routes based upon the historical airlift needs of the Services and MAC's current airlift capability. Once the routes are selected, the Army's allocation of unsubscribed airlift capacity is derived based upon historical lift analysis.

6-5. AIR ELIGIBLE CARGO TYPES

a. Table 6-1 depicts the classes of cargo transported by sealift and those cargo classes that are divertible for the TP-4 airlift program.

Table 6-1. Cargo Commodity Classes

Commodity	Cargo types with potential cost savings	Cargo types possibly specified for air movement	Reason not eligible for TP-4 air
1. General	X	X	
2. Special	X	X	
3. HHG	X	X	
4. CONEX		X	
5. Cargo trailer		X	
6. Freeze			MAC
7. Chill			MAC
8. POV			ODCSLOG
9. Coal			Not air eligible
10. Ammunition		X	
11. Bulk			Not air eligible
12. Aircraft		X	

(1) Of the 12 commodity classes, 3 classes represent potential transportation cost savings. The cost savings are achieved by reducing the packing costs of Army cargo through use of the TP-4 program. As indicated in paragraph 2-5b (Chapter 2), the TP-4 airlift rate is identical to the surface rate for over-ocean transportation. However, the Army can reduce its total transportation cost by diverting air eligible cargoes packed at surface POEs to APOEs because packing costs (as discussed in paragraph 6-7) are included in the TP-4 rate. According to the TP-4 formula (paragraph 2-5), two-thirds of the surface packing cost can be avoided. In FY 83, general, special, and HHG cargo classes accounted for 87 percent of the Army's containerized cargo shipments. MTMC data for FY 83 indicated that about 20 percent of containerized shipments are packed at surface POEs. Thus, about 200 MTON of these cargo classes, or 5.4 percent of the Army's total surface lift, would be available for diversion.

(2) CONEX, cargo trailers, aircraft, and ammunition are classes of cargo that are air eligible. However, packing costs are not eliminated for transporting CONEXs and cargo trailers; thus, the advantage of using TP-4 airlift diminishes. Small arms ammunition is air eligible, but due to security problems, most ammunition types are packed at the source rather than the port. Finally, some aircraft items are air eligible, but outsize restrictions of cargo aircraft limit their consideration.

(3) MAC eliminated freeze or chill items from consideration as air eligible commodities for the TP-4 airlift program. Projected delays while awaiting available airlift space combined with limited APOE storage facilities were the reasons for elimination of those items. Bulk and coal commodity classes are not air eligible because they are not suitable for shipment in a container or a pallet.

b. Once identified, surface cargo classes eligible for airlift are evaluated for diversion. The first step in the process is to examine the historical lift profile of the commodity classes. The data for this analysis were obtained from the MTMC manifest data base. As stated in paragraph 6-2, Army cargo types are identified in the MTMC data base by route and by the MILSTAMP three-digit water commodity code. The lift profiles provide a monthly historical record of the quantity and type of cargo transported on a particular surface route. Since the TP-4 program will be based upon an allocation system, expected flows of cargo types on particular surface routes must be developed. The flows developed from the lift profiles indicate the lift demand of cargo commodities on selected surface routes. Also, the cargo flows identify the quantity and type of cargo commodities that could be recommended for diversion in order to fill the Army's allocation of unsubscribed airlift capacity.

6-6. MODEL TO PRIORITIZE AIR ELIGIBLE CARGO

a. As discussed in paragraph 3-2, Chapter 3, a transportation priority system based upon unit need, mission, and type of materiel requested currently exists. The MTMC data base lists the surface cargo types transported on a given surface route by MILSTAMP priority. Therefore, the unsubscribed

capacity for a selected air route will first be filled with divertible surface cargo according to the MILSTAMP transportation priority system. If the amount of air eligible cargo to be diverted exceeds the amount of unsubscribed capacity available, the types of cargo within that transportation priority category will be prioritized using a MADM technique. For example, if the airlift capacity for a particular route was 400 STON/year and the amount of air eligible TP-3 cargo was 1000 STON/year, the MADM technique would be employed to prioritize the TP-3 surface cargo types for diversion. The MADM technique discussed below was developed as a management tool to help ODCSLOG personnel prioritize surface cargoes for diversion within the MILSTAMP transportation system.

b. Given the nature of the problem, several MADM techniques were researched for possible application to the problem. The Technique for Ordered Preference Similar to the Ideal Solution (TOPSIS) was selected based upon its flexibility, theory, and application to the problem. A more detailed description of the TOPSIS methodology is contained in Appendix D.

c. The basic concept behind TOPSIS is that for a given set of alternatives with defined attributes (characteristics), an ideal solution, A*, and a negative ideal solution, A-, exist.[3] The ideal solution comprises all the best attribute values attainable, whereas the negative ideal solution consists of all the worst attribute values attainable. The alternatives are ranked based upon their relative closeness to the ideal solution. Figure 6-2 depicts a visual example of this technique. As illustrated in the diagram it cannot be determined whether alternative A_1 is preferred to alternative A_2 based solely upon visual inspection. A_1 is closer to the ideal solution but also closer to the negative ideal solution. Alternative A_2 is farther from the negative ideal solution but also farther from the ideal solution. Equation 6-1 is used to compare the relative closeness "C*" for each alternative to the ideal solution and determine the preferred alternative. The distances between each alternative and the ideal or negative ideal solutions are measured based upon Euclidian geometry, i.e., point-to-point distance measurement.

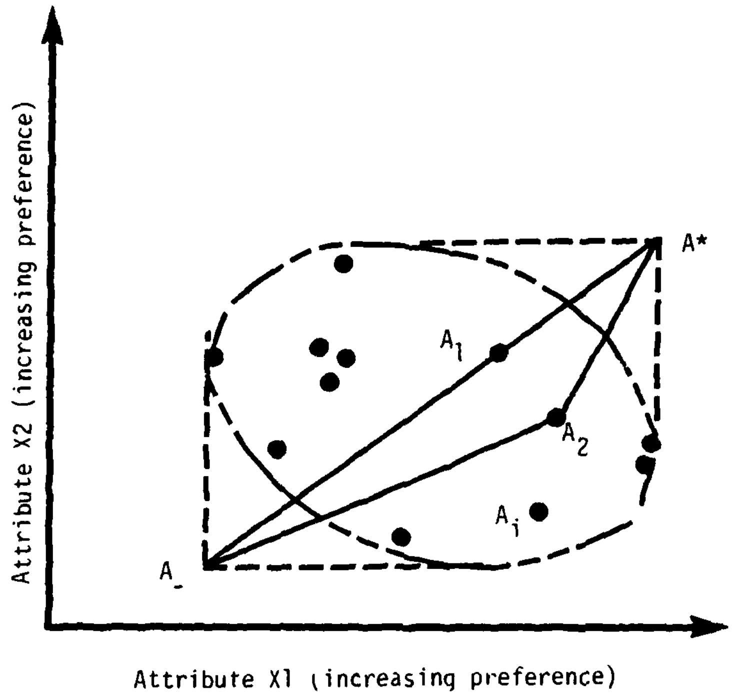


Figure 6-2. TOPSIS Concept

$$C_i^* = \frac{\overline{A\text{-}A_i}}{\overline{A^*A_i} + \overline{A\text{-}A_i}} \qquad \text{where } 0 \leq C \leq 1 \qquad \text{For } i = 1, 2, \ldots m \qquad \text{(Equation 6-1)}$$

d. Data inputs for Equation 6-1 are derived from the attribute values of each alternative as well as the relative weight factors for each attribute. As described in paragraph 6-6b above, each alternative can be characterized by a group of attributes. The attributes may be objective or subjective, and they may present a benefit or a cost. Table 6-2 identifies the list of attributes used in the UIAC analysis. (Appendix D contains a complete explanation of the attributes.) The list represents the characteristics of surface cargoes that affect the selection of divertible cargo types. The list was based upon past studies, USAF memoranda, and general guidance from ODCSLOG. The first two attributes are objective, one is a benefit and the other is a cost. The quantitative values for these attributes were obtained from the MTMC manifest data base. The last four attributes are subjective, and only one of them is a cost attribute. Table 6-3 represents an interval scale that will be employed to quantify the qualitative values of the subjective attributes.

Table 6-2. Cargo Attributes

Attribute	Data description		Attribute effect	
	Objective	Subjective	Benefit	Cost
1. Guaranteed outbound cargo offering (STON/month)	X		X	
2. Density (lbs/cu ft)	X			X
3. Ease of peacetime diversion		X	X	
4. Effects on transition to war		X		X
5. Operational readiness		X	X	
6. Morale effect		X	X	

Table 6-3. Subjective Value Scale

For cost attributes	Scale (cost)	Scale (benefit)	For benefit attributes
	0	0	
Very high	1.0	1.0	Very low
High	3.0	3.0	Low
Average	5.0	5.0	Average
Low	7.0	7.0	High
Very low	9.0	9.0	Very high
	10.0	10.0	

e. In his book, The Analytic Hierarchy Process, Saaty describes his methodology for prioritizing alternatives based upon a sequence of pairwise comparisons among the other alternatives.[4] His methodology was adapted for the UIAC Study as a way to determine the relative importance of each attribute. The attribute weight factors are obtained by first performing a pairwise comparison of all the attributes. The pairwise comparison measures the relative importance of each attribute in comparison to the other attributes. Table 6-4 lists the decision algorithm that was employed to conduct the pairwise comparison. After all of the possible combinations of pairwise comparisons are evaluated, the attribute weight factors are mathematically derived, based upon the importance values assigned, and then normalized. Finally, the normalized weight factors are applied to the attribute values of each alternative to develop the rank order of the alternatives. Appendix D contains a detailed discussion of the mathematics used to derive the attribute weight factors and compute the rank order of the alternatives.

f. After the alternatives are ordered, each air route will be filled with priority cargo until the amount of unsubscribed airlift capacity for that route is exhausted. As discussed in Chapter 5, MAC will compute the unsubscribed capacities for MAC proposed air routes, and ODCSLOG will determine the airlift requirements for Army nominated air routes. Once the unsubscribed capacity is filled with priority cargo, the cargo quantities are converted from STON to MTON to compute the transportation cost avoidance for the particular air route.

Table 6-4. Saaty's Scale for Attribute Weighting

Intensity of importance	Definition	Explanation
1	Equal importance	Two attributes contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one attribute over another
5	Essential or strong importance	Experience and judgment strongly favor one attribute over another
7	Demonstrated importance	An attribute is strongly favored and its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one attribute over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed

6-7. TRANSPORTATION COST AVOIDANCE

a. The cost of transporting over-ocean cargo can be separated into five elements: line haul in CONUS, cargo packing, over-ocean transportation, cargo unpacking, and line haul outside CONUS (OCONUS). Table 6-5 compares the cost elements of TP-4 airlift and sealift for cargoes packed at the respective APOE and POE. The major differences are the packing costs and the OCONUS line haul charges.

(1) Packing costs for cargoes packed at n APOE are included in the TP-4 rate. The packing cost equals one-third of the MTMC rate (paragraph 2-5, Chapter 2). In comparison, the full packing cost is charged for surface cargoes packed at the surface POE.

(2) OCONUS line haul charges for surface cargoes are included in the over-ocean rate paid to MSC because the MSC billing rate is a one-time charge that covers all the elements of over-ocean transportation costs. (NOTE: CONUS line haul charges would normally be included in the MSC rate

if the cargo was packed for movement at an Army depot. However, if cargoes are packed at the seaport, the line haul cost must be paid separately by the Army. The Army is not reimbursed by MSC for the extra line haul cost nor is the over-ocean rate reduced for those types of cargo.) In contrast, airlift cargo arriving at an APOD is delivered to the final destination by organic Army or Air Force transportation resources. As such, OCONUS airlift line haul charges do not represent an additional use of transportation funds, but they do represent an additional use of transportation resources. However, if organic transportation resources are inadequate (paragraph 3-4d, Chapter 3), additional transportation funds may be required to defray costs incurred by moving cargo commercially that otherwise would have been moved by military transportation.

Table 6-5. Elements of Army Over-ocean Transportation Costs

	Airlift	Sealift
Line haul CONUS	Origin to APOE	Origin to POE
Packing	(Included in MAC rate)	MTMC rate at POE
Over-ocean transportation	MAC TP-4	MSC rate
Unpacking	(Included in MAC rate)	(Included in MSC rate)
Line haul OCONUS	Army transportation to destination	(Included in MSC rate)

b. Transportation cost avoidance is computed for each route as the difference in mode transportation costs (surface or air) measured in \$/MTON times the amount of cargo diverted from surface lift to fill the unsubscribed capacity allocation. Mathematically, cost avoidance (CA) is represented as follows:

$$CA_i = \sum_{j=1}^{n} \text{cargo}_{ij} \; (\text{airlift cost}_i - \text{surface cost}_i)$$

If positive, the cost avoidance represents a benefit to the Army, and the cargo types on that route should be favorably considered for diversion. If negative, the cost avoidance represents an additional outlay of Army transportation funds. Cargo types should not be diverted on these routes unless other factors warrant the additional use of transportation funds.

c. After transportation cost avoidances are computed for each route, the routes are ranked in order of cost avoidance from highest to lowest. Routes are then selected for consideration until the Army's total allocation of unsubscribed capacity is satisfied. If Army-nominated routes fall within the group, the unsubscribed capacities of MAC proposed routes are adjusted to offset the redistribution of unsubscribed capacity to the Army nominated air routes. Also, required actions in accordance with AR 59-8 must be completed by ODCSLOG to establish the frequency or requirement channel for movement of Army cargo on Army nominated air routes.

CHAPTER 7

STUDY RESULTS

7-1. INTRODUCTION. As stated in Chapter 5, the study scope was reduced to an evaluation of the air routes identified by MAC to contain unsubscribed capacity. The methodology discussed in Chapter 6 is applicable to air routes proposed by the Army, but projected lift requirements for Army-nominated routes were not defined. This chapter will discuss the results from the analysis of the MAC-proposed air routes, an analysis of potential ALOC cost savings, and other results from the UIAC Study research effort.

7-2. MAC-PROPOSED AIR ROUTE ANALYSES

a. Case 1 - Diversion of Only Air-Eligible, Surface Port-packed Cargoes. The TP-4 airlift rate, as discussed in paragraph 6-7, favors the diversion of air-eligible surface cargoes packed at the port to achieve transportation cost avoidances. Therefore, the initial study effort was to analyze the effect of diverting only port-packed surface cargoes to airlift. As detailed in Appendix F, the majority of surface routes did not have enough air-eligible, port-packed cargo to fill the Army's allocation of unsubscribed airlift capacity on each of the parallel MAC proposed routes. Other air-eligible cargo types were not diverted to fill the remaining unsubscribed capacity allocation because additional transportation costs would be incurred. The analysis of the elements of transportation costs (Appendix E) illustrated that if the Army diverts cargoes packed at the source, rather than the port, additional transportation costs generally result. Table 7-1 illustrates the results of diverting only air-eligible, port-packed cargoes on the routes proposed by MAC. A potential transportation cost avoidance of $60,120 in FY 84 could be realized if only port-packed surface cargoes are diverted from surface lift to airlift; however, only 31 percent of the Army's unsubscribed capacity allocation is filled. Also, a negative cost avoidance, i.e., an additional transportation cost, for the Army results from diverting port-packed cargoes on the Travis-Hickam/Guam/Subic/Clark route because the TP-4 airlift rate is higher than the surface rate for port-packed cargoes.

b. Case 2 - Redistribution of the Army's Unsubscribed Capacity Allocation. As stated in paragraph 6-4, MAC indicated that it would redistribute the Army's allocation of unsubscribed capacity if sufficient airlift requirements existed. Based on that premise, unfilled airlift capacity from case number 1 was redistributed to the air routes Travis-Osan/Yokota and Norfolk-Rota/Sigonella because the amount of port-packed cargo eligible for diversion exceeded the amount of available unsubscribed airlift capacities on those routes. Also, since port-packed cargoes diverted on the Travis-Hickam/Guam/Subic/Clark route resulted in additional transportation costs,

the airlift capacity for that route was also redistributed. Table 7-2 illustrates the results from redistributing the Army's allocation of unsubscribed capacity to the routes identified above. In case number 2, 100 percent of the Army's unsubscribed capacity allocation was filled, resulting in a maximum potential cost avoidance of $217,938 for FY 84.

Table 7-1. Case 1, FY 84 Cargo/Route Selection Results - Surface Port Packed

Routes	Army unsubscribed capacity allocation (STON)	Port-packed cargo (STON)		Cost avoidance ($)
		Available	Diverted	
Dover-Rhein Main/ Ramstein	2,580	472	472	34,538
Travis-Yokota/Osan	500	4,008	500	11,625
Dover-Incirlik	315	206	206	6,084
Travis-Kadena	105	71	71	5,446
Dover-Dhahran	375	2	2	1,719
Norfolk-Rota/Sigonella	20	1,000	20	1,202
Norfolk-Rota/Bahrain	5	0	0	0
Travis-Clark/Diego Garcia	75	8	8	127
Travis/Tinker-Germany	140	1	1	122
Charleston-Howard	250	0	0	0
Travis-Hickam/Guam/ Subic/Clark	90	764	90	(743)
Total	4,455	6,532	1,370	60,120

Table 7-2. Case 2, FY 84 Cargo/Route Selection Results - Reallocation

Routes	Army unsubscribed capacity allocation (STON)	Army unsubscribed capacity reallocation (STON)	Cost avoidance ($)
Dover-Rhein Main/ Ramstein	2,580	472	34,538
Travis-Yokota/Osan	500	2,695	22,276
Dover-Incirlik	315	206	6,084
Travis-Kadena	105	71	5,428
Dover-Dhahran	375	2	1,719
Norfolk-Rota/Sigonella	20	1,000	147,626
Norfolk-Rota/Bahrain	5	0	0
Travis-Clark/Diego Garcia	75	8	127
Travis/Tinker-Germany	140	1	122
Charleston-Howard	250	0	0
Travis-Hickam/Guam/ Subic/Clark	90	0	0
Total	4,455	4,455	217,938

c. **Case 3 - Army's Unsubscribed Capacity Allocation Completely Filled.** Finally, assuming that the Army's proposal to reallocate unsubscribed airlift capacity would be rejected by MAC, case number 1 was revisited. The amount of unsubscribed airlift capacity remaining on each route after diverting port-packed cargoes was filled in case number 3 with air-eligible challenged cargo first, and then with other container compatible cargo. Air challenged cargoes were diverted first because the major reason for their initial challenge was the high cost of regular airlift. Since the TP-4 rate is basically a surface equivalent rate, about one-seventh the cost of regular airlift, the cost challenge is not as relevant. However, in the majority of cases, air-eligible challenged cargo is not port-packed cargo, so additional transportation costs are still incurred by rediverting air-eligible challenged cargo from surface lift back to TP-4 airlift. By definition, other container compatible cargoes are source-packed cargoes. As illustrated in Appendix E, the diversion of source-packed cargoes

generally results in additional Army transportation costs. Table 7-3 illustrates the results of diverting both port-packed and source-packed cargoes. In this case, 100 percent of the Army's allocation for each route was filled, but the corresponding cost avoidance was reduced to $41,493.

Table 7-3. Case 3, FY 84 Cargo/Route Selection Results - Capacity Filled

Route	Army unsubscribed capacity allocation (STON)	Cargo type (STON)			Cost avoidance ($)
		Port-packed	Challenged	Other	
Dover-Rhein Main/ Ramstein	2,580	472	2,108	0	(22,039)
Travis-Yokota/Osan	500	500	0	0	11,625
Dover-Incirlik	315	206	4	105	(1,216)
Travis-Kadena	105	71	3	31	3,171
Dover-Dhahran	375	2	5	368	63,361
Norfolk-Rota/Sigonella	20	20	0	0	1,202
Norfolk-Rota/Bahrain	5	0	0	5	854
Travis-Clark/Diego Garcia	75	8	41	26	(2,764)
Travis/Tinker-Germany	140	1	139	0	(587)
Charleston-Howard	250	0	250	0	(5,029)
Travis-Hickam/Guam/ Subic/Clark	90	90	0	0	(743)
Total	4,455	1,370	2,550	535	41,493

7-3. POTENTIAL DSS COST SAVINGS

a. As stated in paragraph 4-6, the focus of the UIAC Study was to determine cost effective ways to use the unsubscribed airlift capacity other than airlift resupply. However, as demonstrated in paragraph 7-2 above, the potential transportation cost avoidances from diverting air-eligible, port-packed cargoes is not very significant. Even more important is the fact that by FY 86, the Army's total allocation of unsubscribed capacity is projected to be 9,260 STON/year. This projection is 42 percent above the total amount of port-packed cargo available for diversion (6,532 STON/year) in FY 84. Assuming that MAC allows the Army to redistribute its allocation of unsubscribed capacity to divert only port-packed cargoes (similar to case number 2, paragraph 7-2b above), the amount of air-eligible, port-packed cargo must increase about 12 percent per year in order to fill the 9,260 STON of unsubscribed capacity. Based upon the historical analysis of Army lift requirements, this growth rate is not realistic. Also, it is unlikely that MAC will reorganize their squadrons to accommodate the air transportation of only Army port-packed cargoes. Therefore, if the Army is required to fill their allocation of unsubscribed capacities, beginning in FY 86, greater amounts of source-packed cargoes must be diverted which will increase the Army's over-ocean transportation costs.

b. One way to offset the potential future increase in transportation costs is to reduce supply pipeline inventories. By shortening the OST of the supply pipeline, one-time cost savings from pipeline inventory reduction are realized. Also, since the TP-4 rate is a surface equivalent rate, the annual transportation cost for maintaining an additional airlift resupply is minimal. Therefore, historical ALOC performance data were analyzed to determine the potential impact of using the Army's allocation of unsubscribed capacity to reduce pipeline inventories.

c. Figure 7-1 depicts the amount of cargo transported via the Europe ALOC for FY 78-FY 83, and a projected amount for FY 84. The average amount of ALOC cargo transported to Europe is about 20,000 STON/year. In contrast, by FY 89 the Army's projected allocation of unsubscribed capacity available on the Dover-Rhein Main/Ramstein route is about 16,000 STON/year. Thus, the data suggests that the current ALOC to Europe could almost be doubled.

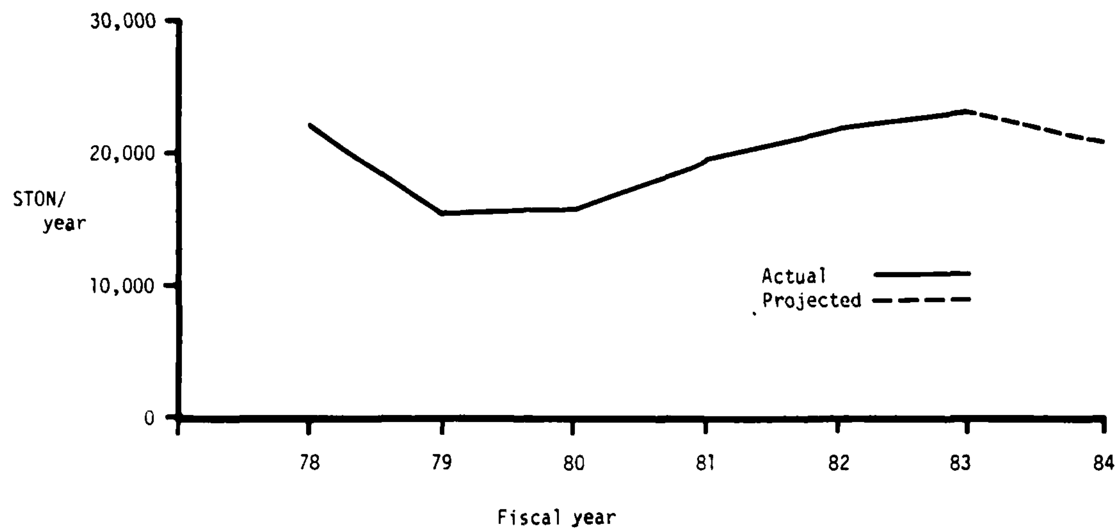


Figure 7-1. Europe ALOC FY 78-84

d. Based upon the above analysis, ALOC performance data from LCA was analyzed.[5] Table 7-4 illustrates the OST segments in days for DSS surface movement, ALOC air movement, and TP-4 air movement. The data for DSS, and ALOC time segments is derived from performance evaluation data for the months March-May 1984.

Table 7-4. USAREUR 3-Month Average Army, GSA, DLA Order-Ship Time (days)

	DSS	ALOC	TP-4
In-theater processing[a]	3.5	3.9	3.7
NICP processing[a]	3.1	1.6	2.3
Depot processing & hold time,[b] transit to CCP, CCP processing, & cargo accumulation	17.7	7.9	13.5
In transit to POE, POE process & await scheduled lift,[c] in transit POE to POD	20.6	2.4	21.1
POD processing and in transit to SSA	7.4	2.0	2.0
SSA processing[a]	7.1	5.5	6.3
Total[f]	60.1	22.3	48.9
	Pessimistic	**Probable[d]**	**Optimistic[e]**
Surface	60.1	60.1	60.1
TP-4 air	48.9	43.9	38.9
Pipeline savings	11.2	16.2	21.2

[a]Time averaged since not dependent upon MSC, MAC, or MTMC.
[b]CCP processing time adjusted to DSS time segment.
[c]TP-4 20-day processing time at APOE (max).
[d]TP-4 15-day processing time at APOE.
[e]TP-4 10-day processing time at APOE.
[f]Total does not represent sum of individual segments because start and completion times for segments overlap.

e. The time segments for TP-4 air movement are derived from a combination of the two data sets. Generally, TP-4 air movement data are identical to the ALOC data except for the cargo processing time at the container consolidation point (CCP) and the port hold time awaiting scheduled lift. In the case of the CCP processing time, the time segment for DSS cargo movement was substituted because TP-4 cargo will probably not be processed as quickly as ALOC cargo. In the case of port hold time awaiting scheduled lift, MAC's projection of probable aerial port delays was used. Accordingly, the maximum allowable delay was stated as 20 days. If delayed that long, MAC indicated that the TP-4 cargo would be moved immediately. Fifteen days were estimated to be the most probable delay based upon the unofficial results of a MAC test of USAF TP-4 cargo movement outbound from the west coast. Finally, 10 days were estimated to be the shortest APOE delay for TP-4 cargo. The analysis results indicated that potential pipeline savings from TP-4 airlift resupply for Europe ranged between 11.2 to 21.2 days. Similar analyses were conducted for the other ALOCs and are depicted in Table 7-5.

Table 7-5. Potential ALOC Pipeline Savings (days)

	Pessimistic[a]	Probable[b]	Optimistic[c]
Europe	11.2	16.2	21.2
Korea	4.4	9.4	14.4
Japan	8.0	13.0	18.0
Hawaii	(4.6)	0.4	5.4

[a]Assumes 20-day cargo processing delay.
[b]Assumes 15-day cargo processing delay.
[c]Assumes 10-day cargo processing delay.

f. Pipeline dollar savings are a function of four variables:

- Inventory value of the pipeline in terms of dollars/day
- OST reductions in terms of days
- Available cargo quantity in terms of STON
- Available cargo capacity in terms of STON

The DSS surface pipeline in Europe is estimated to be about $750,000-$1,000,000/day. Applying the probable OST savings of 16.2 days, this equates to a potential one-time savings from pipeline inventory reduction of $12.2-$16.2 million (M). However, this potential savings is also affected by the amount of cargo eligible for diversion in the pipeline, and the amount of air capacity available. Data estimates indicate that the

amount of DSS surface cargo eligible for diversion to airlift in Europe is about 40,000 STON/year. When compared to the Army's projected allocation of unsubscribed capacity for the Dover-Rhein Main/Ramstein route for FY 85, 3,060 STON/year, about 8 percent of the eligible DSS cargo could be diverted in FY 85. During each subsequent year, additional amounts of DSS cargo could be diverted to airlift until the amount of unsubscribed capacity on the Dover-Rhein Main/Ramstein route is exhausted. Thus, a potential one-time savings of $.9M to $1.2M could be realized in FY 85. The total potential one-time savings for the 5-year period could range between $4.9M to $6.5M.

7-4. OTHER RESULTS

a. As detailed in Appendix E, the TP-4 rate is not accurate. Delayed delivery of MSC's COMSCINST 7600.3G (billing rate) requires that MAC apply MSC's average change in container rates to the TP-4 rate for the previous year to derive the current TP-4 rate, i.e., FY 83 TP-4 rate times the estimated change in MSC's FY 84 container rate equals the FY 84 TP-4 rate. In the majority of cases, rate discrepancies exist because an average container increase is used to develop the TP-4 rate, and not the actual container rate for that route.

b. Shipment delays of TP-4 air cargo awaiting airlift at APOEs will probably create additional storage problems at MAC terminals. Currently MAC is appraising the impact of the projected increases of TP-4 cargo shipments on current storage facilities. The results of that appraisal were not available at the writing of this report. However, if MAC storage facilities are inadequate, TP-4 cargo may be stored at the APOE unprotected. This may require that the packing of TP-4 cargo shipments be modified to withstand inclement weather.

c. If the Army is required to fill their allocation of unsubscribed capacity with source-packed cargoes, additional transportation costs will be incurred because of added packing costs. Data obtained from MAC's study on prepalletized cargo indicated that, generally, the Army packs its own cargo (Table 7-6).[6] Therefore, if source-packed cargoes are used in the future to fill the Army's unsubscribed capacity allocation, the packing cost included in the TP-4 rate formula should be eliminated.

Table 7-6. Prepalletized Cargo For MAC Airlift (January-June 1983)

Service	Total cargo (STON)	Prepalletized	Percent of total
Army	49,282	14,793	30
Navy	31,547	0	0
Air Force	69,338	0	0
Marine Corps	2,542	0	0

CHAPTER 8

SATISFACTION OF ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

8-1. **INTRODUCTION.** The course of the study was, to a significant extent, guided by the sponsor's designated EEA. All of the questions in the EEA were answered during the study.

8-2. **SYNOPSIS OF EEA.** Discussion of the EEA is contained throughout the report. The study EEA are restated below and the answers to them follow:

a. **What specific airlift channels and sealift routes will be affected by additional airlift capacity?** Table 5-3, Chapter 5, depicts the air channels that are projected to contain additional or unsubscribed airlift capacity. Tables 5-4 and 5-5, Chapter 5, depict the Army's projected allocation of unsubscribed capacity for FY 84-89. Appendix F lists the particular sealift routes that will be affected by increases in unsubscribed airlift capacity on each of the parallel air routes discussed in Chapter 5.

b. **What types and sizes of cargo are most appropriate to be reprogramed from the sealift shipment mode to the airlift mode?** The analysis of cargo commodity classes (Chapter 5) indicates that general, special, and HHG cargoes are the most appropriate cargoes to be reprogramed from sealift to airlift. Appendix F contains a list of the recommended divertible cargo types for the surface routes discussed in paragraph 8-2a above by route, weight, and commodity class. Also, Figures F-1 to F-9 depict the specific commodity types recommended for diversion by route, weight, and MILSTAMP water commodity code. Chapter 7 illustrates that the potential transportation cost avoidance from diverting surface cargoes to airlift to fill the Army's projected FY 84 allocation of unsubscribed capacity is between $34,818 and $217,790.

c. **If the proposed Airlift Service Industrial Fund (ASIF) tariff is implemented, how will it alter the selection process for reprograming cargo for airlift?** Chapter 2 details the formula for the proposed incentive tariff TP-4 rate for cargoes designated to fill MAC's unsubscribed capacity. Generally the rate favors the diversion of port-packed cargoes because airlift cargo port packing costs are included in the airlift rate. Also, the TP-4 airlift rate cost is measured by the cubic foot, in contrast to the other airlift rates which are measured by the pound. Finally, the implementation of a TP-4 rate requires that cargoes be programed to fill the Army's allocation of unsubscribed airlift capacity.

d. **How and to what extent does the process developed help traffic managers identify what cargo categories should be diverted from sealift to airlift?** The cargo selection process described in Chapter 6 provides the sponsor with a system to evaluate the cargoes to recommend for diversion for a particular air route and the resulting cost avoidance from the diversion. Also, the decisionmaking technique described in Chapter 6 will assist the sponsor in incorporating his transportation judgment and expertise to prioritize cargo alternatives for diversion.

CHAPTER 9

CONCLUSIONS

9-1. INTRODUCTION. The diversion of air-eligible surface cargo to fill the Army's allocation of unsubscribed airlift capacity will not have a significant impact on Army over-ocean transportation costs. However, by FY 89, the Army's projected allocation of unsubscribed capacity will increase the total amount of peacetime airlift capacity available to the Army by 60 percent. The Army can potentially realize some transportation cost savings by diverting air-eligible, port-packed cargo, but the projected Army allocations of unsubscribed capacity suggest that the possibility of increasing airlift resupply be reconsidered.

9-2. UNSUBSCRIBED CAPACITY

a. MAC's flying hour program and the procurement schedule of new aircraft for the MAC fleet are the major determinants affecting the amount of unsubscribed capacity on selected air routes.

b. The Army's projected total allocation of unsubscribed airlift capacity on the routes proposed by MAC exceeds the Army's historical utilization of peacetime airlift capacity.

c. The fielding of force modernization items will probably increase the growth of Army airlift requirements slightly, but the overall growth of Army airlift requirements will not be enough to fill the Army's allocation of unsubscribed capacity by FY 89.

d. Diverting only port-packed air-eligible cargoes will not generate enough cargo to fill the Army's unsubscribed capacity allocation beyond FY 86.

e. The cargo route selection process provides the sponsor with a systematic approach to evaluating the types of surface cargoes to divert to airlift and the resulting transportation cost avoidance from the diversion.

9-3. TRANSPORTATION COST AVOIDANCE

a. The proposed incentive ASIF tariff is a surface equivalent rate that generally favors the diversion of port-packed cargoes to realize transportation cost avoidances. If source-packed cargoes are diverted, additional transportation costs are normally incurred.

b. Due to external factors, the published TP-4 rate is not accurate when compared to the computed rate using the actual TP-4 formula. Generally, rate discrepancies exist which will affect the selection of suitable air routes for cargo diversion.

c. Projected Army allocations of unsubscribed capacity, and potential pipeline inventory cost avoidances suggest that increasing the utilization of airlift capacity for resupply purposes be reexamined. In conjunction, a field test should be conducted to determine the actual APOE delays for Army TP-4 cargo and the related impacts on the depots and transportation units involved with the packing and distribution of Class II and IX cargoes.

APPENDIX A

STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Director

CPT(P) J. A. Sorenson, Strategy, Concepts and Plans Directorate

b. Team Member

Mr. J. DePalma, Route Analysis, Strategy, Concepts and Plans Directorate

c. Other Contributors

Mr. B. Graham, Analysis Support Directorate

Mr. T. Johnson, Analysis Support Directorate

2. PRODUCT REVIEW BOARD

MAJ J. Dernar (Chairman), Computer Support Directorate

MAJ S. Bailey, Modeling Directorate

MAJ R. Peresich, Strategy, Concepts and Plans Directorate

APPENDIX B

STUDY DIRECTIVE

DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR LOGISTICS
WASHINGTON, D.C. 20310
April 19, 1984

DALO-TSP-C3 84500808L   19 APR 1984

MEMORANDUM FOR THE DIRECTOR, U. S. ARMY CONCEPTS ANALYSIS AGENCY

SUBJECT: Study Directive - Utilization of Increased Airlift Capability (UIAC)

1. Purpose of the Study Directive. This directive tasks the U. S. Army Concepts Analysis Agency (CAA) to conduct subject study.

2. Background

a. Military Airlift Command (MAC) is a single manager operating agency for the Department of Defense (DOD) and is responsible for maintaining a global airlift system in a state of readiness to deploy and support balanced forces to all parts of the world to meet contingency or wartime needs. During peacetime, MAC maintains and operates a DOD airlift service system within limits approved by the Secretary of Defense to maintain an adequate emergency readiness position and carry out realistic training programs. Cargo and passenger airlift is provided from two sources:

(1) The peacetime flying program (C-130, C-141, and C-5 aircraft).

(2) The Civil Reserve Air Fleet (CRAF) program.

b. Beginning in FY 1984, the additive capacity available from purchases of KC-10 aircraft and procurement of additional CRAF capacity will result in a capability that will exceed projected DOD peacetime requirements by 10 percent. The procurement of C-5B aircraft beginning in FY 1986 will significantly increase the total airlift capacity. By FY 1989 total airlift capacity will exceed projected DOD peacetime requirements by 37 percent.

c. As a major user of lift assets, the Army will be required to consider increasing its utilization of available airlift. To support this increased utilization, the Army needs to:

(1) Reevaluate the current use of air and sea transport modes.

DALO-TSP-C3
SUBJECT: Study Directive - Utilization of Increased Airlift Capability (UIAC)

(2) Develop a process to select cargo/route combinations best suited to use the additional capacity.

3. Study Sponsor and Sponsor's Study Director. HQDA, ODCSLOG is the study sponsor. COL Bernard J. Clark, Transportation Management Division (DALO-TSP), Transportation, Energy and Troop Support Directorate, ODCSLOG, will be the sponsor's study director.

4. Study Agency. U. S. Army Concepts Analysis Agency (CAA).

5. Terms of Reference

a. Scope. This study will examine the requirement for over-ocean movement of Army sponsored cargo in the 1984-1989 timeframe and develop a process to select the cargo/route combination best suited to use the additional airlift capacity.

b. Objectives

(1) Identify the range of airlift capability that will be made available to the Army due to the MAC fleet expansion program and the CRAF program.

(2) Develop criteria for the selection of cargo categories for air shipment. These criteria will include but not be limited to:

(a) Cost of airlift.

(b) Contribution to route utilization.

(c) Effects on transition to war.

(3) Identify those data affecting the selection of cargo and route as most appropriate for airlift shipment and produce a data base to facilitate the evaluation of cargo categories for reprograming from sealift to airlift.

(4) Develop and document a process for use by the sponsor in selecting cargo/route combinations best suited for using the additional airlift capacity. Prepare pro forma analysis detailing aggregate airlift cargo shipments during FY 1984-1989 based upon cargo category criteria, routes, and different percentage levels of airlift capacity usage.

DALO-TSP-C3
SUBJECT: Study Directive - Utilization of Increased Airlift Capability (UIAC)

c. Timeframe. FY 1984-1989.

d. Assumptions

(1) MAC by-product airlift capacity will increase to levels detailed in MAC study "Airlift Management in a New Era."

(2) CRAF peacetime commitment will be retained and increased commensurate with increase in MAC fleet capability.

(3) Proposed Airlift Service Industrial Fund (ASIF) tariff changes will be implemented to make MAC airlift services more cost competitive with the commercial airline industry.

(4) Forecasted unsubscribed cargo capacity will not be assigned in support of JCS exercises.

e. Essential Elements of Analysis

(1) What specific airlift channels and sealift routes will be affected by the need to utilize additional airlift capacity?

(2) What types and sizes of cargo are most appropriate to be reprogramed from the sealift shipment mode to the airlift shipment mode?

(3) If the proposed ASIF tariff is implemented, how will it alter the selection process for reprograming cargo for airlift in (2) above?

(4) How and to what extent does the cargo selection process help traffic managers identify what cargo categories should be diverted from sealift to airlift?

6. Responsibilities

a. Army Staff and Field Operating Agencies will provide support as required for areas of responsibility and interest.

b. Military Traffic Management Command (MTMC) will provide data as required.

c. Coordination will be made with the Military Sealift Command, MAC, Air Force, and Navy.

DALO-TSP-C3
SUBJECT: Study Directive - Utilization of Increased Airlift Capability (UIAC)

7. Literature Search

a. MTMC and MAC airlift studies and reports.

b. Office, Secretary of Defense airlift studies and reports.

c. Defense Technical Information Center (DTIC).

8. References

a. DODD 5160.1, Single Manager Assignment for Ocean Transportation, July 1970

b. DODD 5160.2, Single Manager Assignment for Airlift Service, October 1973

c. DODD 5160.53, Single Manager Assignment for Military Traffic, Land Transportation and Common-User Ocean Terminals, January 1974.

d. JCS Pub 15, Mobility System Policies, Procedures and Considerations, June 1975.

e. AR 5-5, Army Studies and Analyses, October 1981

f. AR 55-30, Space Requirements and Performance Reports for Transportation Movements, September 1982

g. AR 55-355, Military Traffic Management Regulation, December 1982

h. AR 59-8, Department of Defense (DOD) Common User Airlift Transportation, August 1982.

i. DA Pam 5-5, Guidance for Army Study Sponsors, Sponsor's Study Directors, Study Advisory Groups and Contracting Officer's Representatives, April 1982

9. Administration

a. Support. CAA will provide all funds and administrative support necessary for conduct of subject study.

b. Milestone Schedule

(1) 29 February - study directive and study plan approved

4

DALO-TSP-C3
SUBJECT: Study Directive - Utilization of Increased Airlift Capability (UIAC)

(2) 30 June - In Process Review brief

(3) 30 September - publish report

c. Control Procedures

(1) COL Bernard J. Clark, Transportation Management Division (DALO-TSP), ODCSLOG, will be the study sponsor's director. Mr. Roger Shriver, DALO-TSP, telephone 694-4082 or AUTOVON 224-4082, will be the HQDA point of contact (POC) for subject study.

(2) For purposes of data collection, direct coordination between CAA and the submitting agency is directed.

(3) DALO-TSP will prepare initial DD 1498.

(4) CAA will submit final approved document to DTIC.

(5) Study sponsor will prepare an evaluation of study results IAW AR 5-5.

d. Coordination. This tasking directive has been coordinated with CAA IAW AR 10-38.

FOR THE DEPUTY CHIEF OF STAFF FOR LOGISTICS:

for JIMMY D. ROSS
Brigadier General, GS
Director of Transportation,
Energy and Troop Support

APPENDIX C

REFERENCES/BIBLIOGRAPHY

REFERENCES

1. Wehner, Clement E., MAJ (USAF), Combat Readiness and the Flying Hour Program, Airlift, Spring, 1984

2. Airlift Management in a New Era, Military Airlift Command, July 1983

3. Hwang, Ching-Tai and Kwangsen Yoon, Multiple Attribute Decision Making, Springer-Verlag, New York, NY, 1981

4. Saaty, Thomas L., The Analytic Hierarchy Process, McGraw-Hill Inc., New York, NY, 1980

5. Direct Support System and Air Line of Communication Performance Evaluation, RCS CSGLD 1557, US Army Logistics Control Activity, May 1984

6. Cargo Palletization, Military Airlift Command, January 1984

7. Clarke, Ray M., et al., Routine Economic Airlift, Research Analysis Corporation, April 1972

8. The Air Logistic Pipeline Study, Department of Defense, 1976

9. O'Conner, W., et al., Analysis of Air Line of Communications, Europe (ALOC-E) Order-Ship-Time Segments for Effects on Materiel Management, System Cost and Operational Readiness, US Army Materiel Systems Analysis Activity, January 1981

BIBLIOGRAPHY

DEPARTMENT OF DEFENSE

Department of Defense (DOD) Publications

DOD Directive 5160.10, Single Manager Assignment for Ocean Transportion

DOD Directive 5160.20, Single Manager Assignment for Airlift Service

DOD Directive 5160.53, Single Manager Assignment for Military Traffic, Land Transportion and Common User Terminals

DOD Regulation 4500.32-R, Military Standard Transportation and Movement Procedures

Joint Chiefs of Staff (JCS) Publication

JCS Publication 15, Mobility System Policies, Procedures and Considerations

DEPARTMENT OF THE ARMY

Department of the Army (DA) Publications

AR 55-30, Space Requirements and Performance Reports for Transportation Movements

AR 55-355, Military Traffic Management Regulation

AR 59-3, Movement of Cargo by Scheduled Military and Commercial Transportation - Outbound

AR 59-8, Department of Defense (DOD) Common User Airlift Transportation

US Army Materiel Command (AMC)

AMC Reg 55-8, Control of Premium/High Speed Transportation

Military Traffic Management Command (MTMC)

MTMC Circular 55-83-3, Port Handling Billing Rates, FY 84

DEPARTMENT OF THE AIR FORCE

US Air Force (USAF) Publications

AFR 75-15, Reports for Military Transportation Requirements

AFR 76-11, US Government Airlift Rates

US Air Force Military Airlift Command (MAC) Publication

Quarterly Airlift Management Report, RCS: DD-I&L(Q) 1299

DEPARTMENT OF THE NAVY

US Navy Military Sealift Command (MSC) Publication

COMSC Instruction 7600.3G, MSC Billing Rates

APPENDIX D

TECHNIQUE FOR ORDERED PREFERENCE SIMILAR TO THE IDEAL SOLUTION (TOPSIS) METHODOLOGY

D-1. INTRODUCTION. The purpose of this appendix is to detail the theory and mathematics behind the Technique for Ordered Preference Similar to the Ideal Solution (TOPSIS). TOPSIS is a particular multiple attribute decision-making (MADM) technique that mathematically orders a finite set of alternatives using attribute values for each alternative and attribute weights. The technique incorporates the judgments of the decisionmaker, analyzes the consistency of the judgments, and develops a formalized system to evaluate the alternatives. In real situations, the number of alternatives with associated attributes is usually more than two. This technique aids the decisionmaker in reducing a complex n-dimensional problem (attributes and alternatives) into several two-dimensional problems that are solved more easily.

D-2. ATTRIBUTES

a. Attributes are characteristics of alternatives which describe either a cost or a benefit associated with that alternative. Also, the attribute data may be subjective or objective in nature. Objective attribute data for this study were obtained from the MTMC transportation billing data base. Subjective attribute data were obtained from interviews with ODCSLOG personnel involved with transportation decisionmaking.

b. Table D-1 describes attributes used to select alternative cargo types in this study.

Table D-1. Cargo Attributes

Attribute	Data description		Attribute effect	
	Objective	Subjective	Benefit	Cost
1. Guaranteed outbound cargo offering (STON/month)	X		X	
2. Density (lbs/cu ft)	X			X
3. Ease of peacetime diversion		X	X	
4. Effects on transition to war		X		X
5. Operational readiness		X	X	
6. Morale effect		X	X	

(1) The first two attributes, guaranteed cargo offerings, inbound and outbound, represent demand data of particular cargo commodities on selected surface routes. The data describe shipments of cargo on surface routes that parallel selected air routes in STON/month. This facilitates the analysis of filling capacity allowances on the air routes. These attributes are benefit attributes since surface cargo demand is required for finding divertible cargo candidates. Also, the larger the demand for a particular commodity, the fewer the number of cargoes are needed for diversion. Fewer divertible cargoes will minimize disruptions in the Army's current transportation system.

(2) Density is an objective cost attribute because the TP-4 air cargo tariff favors low density cargoes. The less it weighs, the more cargo can be used to satisfy STON allocations of unsubscribed capacity.

(3) Ease of peacetime diversion is a subjective benefit attribute. It represents the ease with which a particular type of cargo can be diverted to air. Analysis of MTMC data indicates that some cargo commodities are obtained from several suppliers. The fewer the number of suppliers of a particular cargo commodity, the easier it will be to direct the diversion program.

(4) Effects on transition to war is a subjective cost attribute. It represents the "hidden" cost of rediverting cargo delivered during peacetime by excess airlift capability to a surface resupply mode during wartime. According to USAF reports, the by-product excess cargo capacity generated by the peacetime flying hour program will be initially used to deploy materiel and men during wartime and not resupply; therefore, the major effort is to avoid selecting those cargo types which have a significant impact on wartime resupply.

(5) Operational readiness is a subjective benefit attribute. It represents how the particular cargo commodity will affect the operational readiness of units in the field. Objective data is not available for this attribute. Thus, reliance is placed on the logisticians' judgment of the operational readiness impact of a cargo commodity at the unit level.

(6) Morale effect is a subjective benefit attribute. It identifies how the item affects the overall morale of the soldier who receives the item. Again, this attribute is difficult to quantify, but reducing the transportation time of selected cargo items will improve soldier morale. Cargo types that would receive a high value for this attribute are AAFES items, HHG, etc.

c. Qualitative attributes are commonly converted into numerical values through the use of a bipolar interval scale. Use of an interval scale permits the decisionmaker to express preferences of the attribute quantitatively. A standard unit of preference must be designed to allow comparison and measurement of changes in the decisionmaker's perceptions. This is referred to in literature as the unit of just noticeable difference (jnd) unit. Also, the interval scale is designed with two end points and a midpoint for calibration. The end points represent the maximum and minimum values that are practically or physically realizable. The midpoint represents the breakpoint between values that are favorable and those that are unfavorable.

(1) The interval scale used in the analysis is diagrammed in Table D-2. Note that the cost scale is inverted so that low-cost characteristics are assigned a favorable rating of 10.0. Again, a low cost and a high benefit are favorable characteristics. Favorable characteristics are associated with values between 5.1 and 10.0

Table D-2. Subjective Value Scale

For cost attributes			For benefit attributes
	0	0	
Very high	1.0	1.0	Very low
High	3.0	3.0	Low
Average	5.0	5.0	Average
Low	7.0	7.0	High
Very low	9.0	9.0	Very high
	10.0	10.0	

(2) An assumption of the scale used is that the difference in value between "high" and "low" is the same as the difference between "very low" and "average." Also, the type of scaling assumes that a value of 6.0 is twice as favorable as 3.0. Therefore, employing this scale to assign values to subjective attributes requires careful analysis and consideration. Haphazard selection and association of subjective values could invalidate the conclusions of the analysis.

D-3. ATTRIBUTE WEIGHTS

a. Assignment of attribute weights is the first step toward rank ordering the alternatives. There are several methods which can be employed to assign the weight. One method, Saaty's[4] pairwise comparison of attributes, reduces the assignment problem from a single analysis of n-dimensions to a series of two-dimensional analyses. This method simplifies the problem for the decisionmaker and provides him feedback on the consistency of his judgments.

b. Assignment of weights requires that the decisionmaker quantify his judgment and preferences. This is accomplished through the use of a ranking scale which serves as an algorithm guide for the decisionmaker (Table D-3). Note that this scale is an interval scale. The assumptions and limitations of interval scales as discussed in paragraph D-2b(2) apply to this scale as well.

Table D-3. Saaty's Scale for Attribute Weighting

Intensity of importance	Definition	Explanation
1	Equal importance	Two attributes contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one attribute over another
5	Essential or strong importance	Experience and judgment strongly favor one attribute over another
7	Demonstrated importance	An attribute is strongly favored and its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one attribute over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed

c. In his book, The Analytic Hierarchy Process, Saaty explains the psychological rationale behind the scale and the reason for the interval scale 1-9. Saaty draws on the works of two famous German psychologists, Ernest Weber (1795-1878) and Gustav Fechner (1801-1887). Their works involved analyzing stimuli and responses and formulating laws for measurement. Basically, their laws stated that just noticeable differences in stimuli follow in geometric progression, but the responses increase arithmetically. Solving the equations formed from their analysis resulted in the response measures of 1 through 9. Saaty also conducted analyses on other scales that could be used but concluded the scale 1 through 9 was most appropriate.

d. The weights of the attribute are derived once the attribute matrix is defined. The attribute matrix is an n-square matrix A where the values a_{ij} represent the decisionmaker's judgment of the attribute i in terms of attribute j.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

The judgment a_{ij} represents the relationship between weight of attribute i, w_i and weight of attribute j, w_j. Thus,

$$a_{ij} = \frac{w_i}{w_j} \quad \text{(for } i, j = 1,2,\ldots,n) \qquad \text{(Equation D-1)}$$

The matrix A can also be represented by a ratio of the attribute weights:

$$A = \begin{bmatrix} w_1/w_1 & w_1/w_2 & \cdots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \cdots & w_2/w_n \\ \vdots & \vdots & & \vdots \\ w_n/w_1 & w_n/w_2 & & w_n/w_n \end{bmatrix}$$

Since human judgments and, in fact, physical measurements are never exact in a mathematical sense, some allowance must be made for deviations, otherwise, equation D-1 is unsolvable. Therefore, to make allowances for some deviations, consider row i of matrix A. In the general case, row i is represented by:

$$a_{i1},\ a_{i2},\ \dots\ a_{ij},\ \dots,\ a_{in}$$

In the more precise case, row i is defined as:

$$\frac{w_i}{w_1},\ \frac{w_i}{w_2},\ \dots\ \frac{w_i}{w_j},\ \dots,\ \frac{w_i}{w_n}$$

If the first element is multiplied by w_1, and the second element by w_2, the result is a row of identical elements.

$$\frac{w_i}{w_1} w_1 = w_i,\quad \frac{w_i}{w_2} w_2 = w_i,\quad \dots\ \frac{w_i}{w_n} w_n = w_i$$

$$w_i,\qquad w_i,\qquad \dots\qquad w_i$$

In the general case, the results would be:

$$a_{i1}w_1,\ a_{i2}w_2\ ,\dots,\ \ a_{in}w_n$$

or, a statistical scattering around the w_i. Therefore, Equation D-1 should be written as:

$$w_i = a_{ij}w_j \text{ (for } i,j = 1,2 \dots n) \qquad \text{(Equation D-2)}$$

or as evidenced by the results above,

$$w_i = \text{average of } (a_{i1}w_i,\ a_{i2}w_2\ ,\dots,\ a_{in}w_n)$$

Thus, Equation D-2 can now be defined as:

$$w_i = \frac{1}{n} \sum_{j=1}^{n} a_{ij}w_j \quad (i = 1,2 \dots n) \qquad \text{(Equation D-3)}$$

Equation D-3 allows for some deviation from the exact case Equation D-1; however, a unique set of weights w_i cannot be obtained from Equation D-3. Any change in a_{ij} would result in another set of solutions. However, if n

were to change as a_{ij} changes, then a unique solution would result. Changes in n are denoted as λ_{max}. Therefore, Equation D-3 can now be written as:

$$w_i = \frac{1}{\lambda_{max}} \sum_{j=1}^{n} a_{ij}w_j \text{ (for } i = 1,2 \ldots n) \qquad \text{(Equation D-4)}$$

Equation D-4 results in an eigenvalue problem that is solvable and will result with a unique set of attribute weights.

e. To define the unique set of attribute weights, recall Equation D-1:

$$a_{ij} = \frac{w_i}{w_j} \qquad i,j = 1,2, \ldots, n$$

or

$$a_{ij} \cdot \frac{w_j}{w_i} = 1 \qquad i,j = 1,2, \ldots, n$$

Adding the column values results with

$$\sum_{j=1}^{n} a_{ij}w_j \frac{1}{w_j} = n \qquad i = 1,2 \ldots n$$

or

$$\sum_{j=1}^{n} a_{ij}w_j = nw_i \qquad i = 1,2 \ldots n$$

This is equivalent to

$$Aw = nw \qquad \text{(Equation D-5)}$$

where A is the matrix of judgments a_{ij}, w represents the weight vector of the attribute, and n is an eigenvalue. Using Equation D-1, Equation D-5 can now be expressed as:

$$Aw = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \cdots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \cdots & \frac{w_2}{w_n} \\ \vdots & \vdots & & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \cdots & \frac{w_n}{w_n} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix} = n \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix}$$

As formulated, Equation D-5 represents an eigenvalue problem that can be solved using matrix algebra. Based upon paragraph D-3d above, Equation D-5 can be written as:

$$Aw = \lambda_{max} w$$

where λ_{max} is the highest value of λ that solves the equation. After determining λ_{max}, the attribute weights w_i are derived and normalized so that:

$$\sum_{i=1}^{n} w_i = 1.0.$$

f. As mentioned above, judgments a_{ij} will deviate and cause reciprocating adjustments to λ_{max} in order to solve for a unique set of weights. Deviations in λ_{max} can be measured from the ideal case as depicted in Equation D-3. This deviation is a measure of consistency by the decisionmaker. It provides the decisionmaker with an index to compare his derived scale to the underlying ratio scale he attempted to estimate. The index is based on the formula:

$$\frac{\lambda_{max} - n}{n-1} \leq .1$$

The value .1 is not an absolute number. Generally, if the index is $\leq .1$, the decisionmaker's judgments are considered to be consistent.

g. All of the steps discussed above are incorporated into a user-friendly software package available for microcomputer use. The software package prompts the pairwise comparison judgments of the decisionmaker, computes the attribute weights, and derives the consistency index of the decisionmaker's judgments.

D-4. TECHNIQUES FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SOLUTION (TOPSIS)

a. TOPSIS is a MADM technique used to rank order a finite set of alternatives with associated attribute values and attribute weights. It is based upon the premise that two alternatives, an ideal solution, A*, and a negative ideal solution, A-, exist within a given space. The ideal solution is composed of all the best attribute values attainable. In contrast, the negative ideal solution is composed of all the worst attribute values attainable. The rank order of actual alternatives is thus based upon the concept that the most preferred alternatives will have the shortest distance from the ideal solution and the farthest distance from the negative ideal solution.[3] The concept is illustrated in Figure D-1. Distances are measured in terms of Euclidian geometry, i.e., point-to-point. Although the concept is simple, in reality, the situation is more complex. For example, alternative A_1 above is closer to the ideal solution than alternative A_2. This fact favors the selection of alternative A_1 as the preferred alternative. However, alternative A_2 is farther away from the negative ideal solution than alternative A_1. This favors the selection of alternative A_2. Thus, it is difficult to justify the selection of alternative A_1 or A_2 based solely upon a visual inspection of this figure. However, TOPSIS rank orders the alternatives by computing the relative closeness of each alternative to the ideal solution. The relative closeness, C*, is computed as:

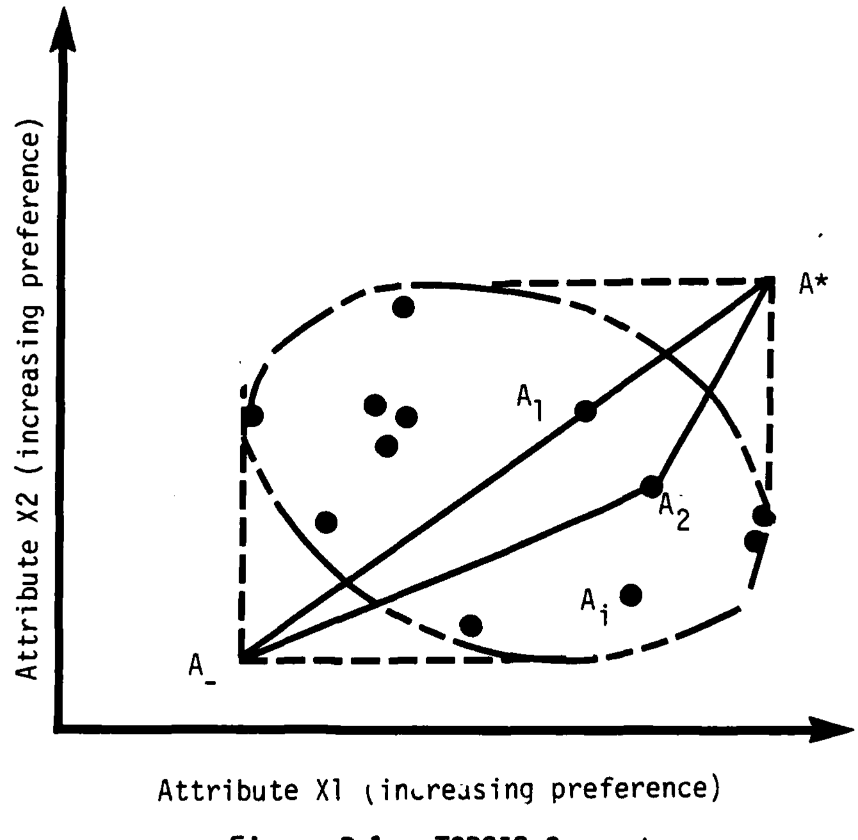


Figure D-1. TOPSIS Concept

$$C_i^* = \frac{\overline{A^-A_i}}{\overline{A^*A_i} + \overline{A^-A_i}} \qquad \text{where } 0 \leq C \leq 1 \qquad \text{For } i = 1, 2, \ldots m$$

Preferred alternatives are associated with the highest possible value of $C \leq 1.0$.

b. The values of C_i^* are derived after completing the six formal steps of the TOPSIS methodology. Each step is discussed in detail below.

(1) Step 1 is to construct a decision matrix. The decision matrix, D, is composed of the alternatives, A_m with associated attributes, (X_n).

$$D = \begin{array}{c|cccccc} & X_1 & X_2 & \cdots & X_j & \cdots & X_n \\ \hline A_1 & X_{11} & X_{12} & \cdots & X_{1j} & \cdots & X_{1n} \\ A_2 & X_{21} & X_{22} & \cdots & X_{2j} & \cdots & X_{2n} \\ A_i & X_{i1} & X_{i2} & \cdots & X_{ij} & \cdots & X_{in} \\ & \vdots & \vdots & & \vdots & & \vdots \\ A_m & X_{m1} & X_{m2} & \cdots & X_{mj} & \cdots & X_{mn} \end{array}$$

where X_{ij} represents the jth attribute value for the ith alternative. The TOPSIS methodology assumes that each attribute, X_n, in the decision matrix increases or decreases monotonically. If values are qualitative, an appropriate subjective scale, such as the one on Table D-2, should be used to derive the values.

(2) Step 2 of the process is to normalize the decision matrix. Normalization is necessary to transform the attribute dimensions into nondimensional attributes for cross comparisons. The normalized values are derived from the formula:

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}}$$

After normalization, each attribute vector has the same unit length.

(3) Step 3 is to construct the weighted normalized decision matrix, V. Weights for this step were derived from the pairwise comparison process as described in paragraph D-3. Each of the attribute values of the normalized decision matrix is multiplied by the weight of that attribute to derive the values V_{ij}.

$$v = \begin{bmatrix} v_{11} & \cdots & v_{1j} & \cdots & v_{1n} \\ \vdots & & \vdots & & \vdots \\ v_{i1} & \cdots & v_{ij} & \cdots & v_{in} \\ \vdots & & \vdots & & \vdots \\ v_{m1} & \cdots & v_{mj} & \cdots & v_{mn} \end{bmatrix} = \begin{bmatrix} w_1 r_{11} & \cdots & w_j r_{1j} & \cdots & w_n r_{1n} \\ \vdots & & \vdots & & \vdots \\ w_1 r_{i1} & \cdots & w_j r_{ij} & \cdots & w_n r_{in} \\ \vdots & & \vdots & & \vdots \\ w_1 r_{m1} & \cdots & w_j r_{mj} & \cdots & w_n r_{mn} \end{bmatrix}$$

(4) Step 4 is to determine the ideal and negative solutions. As defined, the ideal solution is composed of all the best attribute values attainable.

$$A^* = \left\{ (\max_i V_{ij} \middle| j \in J), (\min_i v_{ij} \middle| j \in J') \middle| i = 1,2, \ldots m \right\}$$

$$= \left\{ V_1^*, V_2^*, \ldots, V_n^* \right\}$$

The negative ideal solution is comprised of all the worst attribute values attainable:

$$A- = \left\{ (\min_i V_{ij} \middle| j \in J), (\max V_{ij} \middle| j \in J') \middle| i = 1,2, \ldots, m \right\}$$

$$= \left\{ V_1-, \ V_2- \ldots V_3- \right\}$$

In both cases, J is the set of all benefit attributes and J' is the set of all cost attributes.

(5) Step 5 is to measure the distance between each alternative and the ideal and negative ideal solution. The separation distance, S from each alternative to the ideal solution is defined as:

$$S_i^* = \sqrt{\sum_{j=1}^{n} (V_{ij} - V_j^*)^2} \qquad i = 1,2, \ldots m$$

Likewise, the separation distance to the negative ideal solution is defined as:

$$S_i^- = \sqrt{\sum_{j=1}^{m} (V_{ij} - V_j')^2} \qquad i = 1,2, \ldots, m$$

(6) Step 6, as discussed in paragraph D-4a above, is to determine the relative closeness, C, of each alternative to the ideal solution. Relative closeness is defined as:

$$C_i^* = \frac{S_i-}{S_i^* + S_i-} = \frac{\overline{A\text{-}A}_i}{\overline{A^*A}_i + \overline{A\text{-}A}_i}$$

where $0 \leq C_i^* \leq 1$ for i = 1,2, ... m.

Thus, if $C_i^* = 1.0$, then $A_i = A^*$. The higher the value of C_i^*, the more preferred the alternative. Once calculated, the C_i^* are rank ordered in descending order to determine the preferred order of alternatives.

c. The steps discussed above are incorporated into a software package for microcomputer analysis which was tested by the study team prior to employing it. Attribute values for each alternative are the only inputs required to run the program. The attribute weight algorithm described in Table D-3 is also incorporated into the software package.

APPENDIX E

TRANSPORTATION COST ANALYSIS

E-1. GENERAL. The purpose of this appendix is to detail the steps of analysis that were performed to derive the transportation cost avoidance from diverting surface cargo to airlift. The appendix will include a discussion of the elements of cost for over-ocean transportation of Army-sponsored cargo, an analysis of the TP-4 rate computation and the computation of transportation cost avoidances for each route.

E-2. COST ELEMENTS

a. During peacetime, the Defense Transportation System (DTS) operates in a fashion similar to commercial transportation companies. The respective commands within the DTS are organized as transportation operating agencies (TOA) to facilitate the movement of cargo. Accordingly, the users of the transportation services provided by MSC, MAC, and MTMC pay each respective TOA for their services through intergovernmental fund transfers based upon established rate guides and rules for applying the rate guides.

b. There are five elements of transportation cost for the over-ocean movement of Army-sponsored cargo: CONUS line haul, cargo packing, over-ocean transportation, cargo unpacking, and OCONUS line haul. The cost of transporting cargo depends upon when the cargo is offered to the TOAs for movement. Table E-1 illustrates a comparison of the differences in over-ocean transportation cost for movement of cargoes packed at the APOE or POE.

Table E-1. Elements of Army Over-ocean Transportation Cost

	Airlift	Sealift
Line haul CONUS	Origin to APOE	Origin to POE
Packing	(Included in MAC rate)	MTMC rate at POE
Over-ocean transportation	MAC TP-4	MSC rate
Unpacking	(Included in MAC rate)	(Included in MSC rate)
Line haul OCONUS	Army transportation to destination	(Included in MSC rate)

c. The major difference in over-ocean costs between TP-4 airlift and surface lift is port packing cost. CONUS line haul costs were assumed to be equal since the APOEs and POEs for the air and surface routes analyzed were close in proximity, e.g., Dover APOE, New York POE, Charleston APOE and POE, Travis APOE, and Oakland POE, etc. OCONUS line hauls for delivery of airlift cargo are completed by organic Army or Air Force transportation vehicles. Additional use of these vehicles to transport TP-4 cargo represents an additional use of Army or Air Force resources, but not additional transportation costs to the Army. Therefore, CONUS and OCONUS line haul costs were not included in the analysis of transportation cost avoidance.

d. Each route was evaluated by computing the transportation cost to the Army for both surface and air modes of movement. The specific cost elements of over-ocean transportation for the cargo packed at the port are: documentation, packing and over-ocean transportation costs. The packing and documentation rates were obtained from DA Circular 55-83-3, MTMC Port Handling Billing Rates, dated 1 October 1983. The surface over-ocean transportation rates were obtained from the COMSCINST 7600.3G, MSC Billing Rates, dated 21 October 1983. The TP-4 airlift rates were obtained from AFR 76-11, dated 28 July 1983.

e. Table E-2 illustrates the cost elements for surface transportation for each surface route. This table also compares the transportation costs for port packed cargoes with the transportation costs for source packed cargoes that are delivered to a surface port for transportation to an overseas destination. Table E-3 illustrates the TP-4 airlift transportation costs for each airlift route.

Table E-2. FY 84 Surface Transportation Costs

Port of embarkation	Port of debarkation	Packing-documentation ($/MTON)	Overocean transportation ($/MTON)	Surface cost ($/MTON)	Surface cost (- packing) ($/MTON)
New York	Germany	45.62[a]	79.60	125.22	98.43
New York	Saudi Arabia	45.62[a]	272.35	317.97	281.18
New York	Turkey	45.62[a]	160.20	205.82	169.03
Norfolk	Spain	45.62[a]	79.60	125.22	88.43
	Italy		116.15	161.77	124.98
Norfolk	Bahrain	45.62[a]	272.35	317.97	281.18
Charleston	Panama	45.62[a]	55.70	101.32	64.53
Oakland	Hawaii	31.30[b]	61.40	92.70	70.2
	Guam		95.55	126.95	104.45
	Philippines		70.55	101.85	79.35
Oakland	Diego Garcia	31.30[b]	144.60	175.90	153.40
Oakland	Okinawa	31.30[b]	86.80	118.10	85.60
Oakland	Japan-Korea	31.30[b]	56.00	87.30	64.80
	Korea		59.15	90.45	67.95
Oakland	Germany	31.30[b]	119.40	150.70	128.20

[a]Packing = 36.79
Documentation = 8.83
Total 45.62

[b]Packing = 22.50
Documentation = 8.80
Total 31.30

Table E-3. FY 84 TP-4 Airlift Transportation Costs

Aerial port of embarkation	Aerial port of debarkation	Transportation priority 4 rate ($/cu ft)	Airlift costs ($/MTON)
Dover	Rhein Main-Ramstein	2.76	110.40
Dover	Dhahran	5.25	210.00
Dover	Incirlik	4.95	198.00
Norfolk	Rota-Sigonella	3.07	122.88
Norfolk	Bahrain	5.25	210.00
Charleston	Howard	1.83	73.20
Travis	Hickam	2.38	95.20
Travis	Guam	3.44	137.60
Travis	Diego Garcia	6.04	241.60
Travis	Clark	2.54	98.00
Travis	Kadena	2.86	114.40
Travis	Yokota	1.92	76.80
Travis	Osan	2.25	90.00
Travis	Rhein Main-Ramstein	3.26	130.40
Tinker	Rhein Main-Ramstein	4.60	184.00

E-3. TP-4 RATE ANALYSIS

a. The equation used by the Air Force to calculate the incentive tariff (TP-4) rate was displayed in paragraph 2-4, Chapter 2. There is a difference in the calculated TP-4 rate and the published TP-4 rate because the Air Force calculates and publishes the TP-4 rate based on MSC's estimate of container rate changes (MSC COMSCINST 7600.3G, MSC Billing Rates). In the interim between the draft and published copy of MSC's CCMSCINST 7600.3G, increases or decreases in overseas container and breakbulk rates for individual routes are determined. However, the published TP-4 rate is not adjusted for specific routes.

b. Using the formula described in paragraph 2-4, Chapter 2, TP-4 rates were computed for the air routes proposed by MAC to contain unsubscribed capacity. Table E-4 illustrates a comparison between the computed TP-4 airlift rate and the published airlift rate.

Table E-4. FY 84 TP-4 Airlift Rate Comparison

Routes	Computed ($/MTON)	Published ($/MTON)
Norfolk-Rota/Sigonella	140.00	122.88
Norfolk-Bahrain	296.40	210.00
Dover-Rhein Main/Ramstein	103.60	110.40
Dover-Dhahran	296.40	210.00
Dover-Incirlik	184.00	198.00
Charleston-Howard	80.00	73.20
Travis-Hickam	79.60	95.20
Travis-Guam	113.60	137.60
Travis-Subic/Clark	88.80	101.60
Travis-Kadena	105.20	114.00
Travis-Clark	88.80	101.60
Travis-Diego Garcia	179.60	241.60
Travis-Yokota	74.40	76.80
Travis-Osan	77.20	90.00
Travis-Europe	137.40	130.40
Tinker-Europe	123.34	184.00

E-4. TRANSPORTATION COST AVOIDANCE

a. Transportation cost avoidance is computed for each route as the difference in mode transportation costs (surface or air) measured in $/MTON times the amount of cargo diverted from surface lift to fill the unsubscribed capacity allocation. Mathematically, cost avoidance (CA) is represented as follows:

$$CA_i = \sum_{j=1}^{n} \text{cargo}_{ij} \; (\text{airlift cost}_i - \text{surface cost}_i)$$

If positive, the cost avoidance represents a benefit to the Army, and the cargo types on that route should be favorably considered for diversion. If negative, the cost avoidance represents an additional outlay of Army transportation funds. Cargo types should not be diverted on these routes unless other factors warrant the additional use of transportation funds.

b. Table E-5 illustrates the cost avoidance for each route from diverting only port-packed caroges to airlift. The total cost avoidance from diverting only port-packed cargoes is $60,120. However, only 31 percent of the Army's FY 84 unsubscribed airlift capacity allocation was utilized by diverting port-packed cargoes. There was a sufficient amount of divertible cargo to satisfy the Army's FY 84 airlift capacity but the cargo was on routes with airlift capacity allocations lower than available divertible port-packed cargo.

Table E-5. Transportation Cost Avoidance - Surface Port Packaged

Route	CA	=	MTON diverted	x	(S-A)[a]	+ ½ A (MTON of HHG)
Dover-Rhein Main/Ramstein	$34,538	=	1,187	x	(125.22-110.40)	+ ½ (110.40) (307)
Dover-Incirlik	6,084	=	778	x	(205.82-198.00)	+ ½ (198.00) (0)
Travis-Yokota/	4,429	=	367	x	(87.30-76.80)	+ ½ (76.80) (15)
Osan	7,196	=	990	x	(90.45-90.00)	+ ½ (90.00) (150)
Travis-Kadena	5,446	=	498	x	(118.10-114.40)	+ ½ (114.40) (63)
Dover-Dhahran	1,719	=	13	x	(317.97-210.00)	+ ½ (210.00) (3)
Norfolk-Sigonella	1,202	=	31	x	(161.77-122.88)	+ ½ (122.88) (0)
Travis-Clark	127	=	33	x	(101.85-98.00)	+ ½ (98.00) (0)
Travis-Rhein Main/Ramstein	122	=	6	x	(150.70-130.40)	+ ½ (130.40) (0)
Travis-Hickam	(743)	=	297	x	(92.70-95.20)	+ ½ (47.60) (0)
Total	60,120					

CA $	=	Divertable cargo (MTON)	x	Surface transportation ($/MTON)	-	Airlift transportation ($/MTON)	+ ½	Airlift transportation ($/MTON)	x	HHG cargo (MTON)

[a]S = surface transportation ($/MTON), A = airlift transportation ($/MTON).

c. Sensitivity analyses were performed to achieve total utilization of the Army's projected allocation of unsubscribed capacity for FY 84. The first sensitivity analysis was performed by expanding the Army's allocation of unsubscribed airlift on selected routes to equal the amount of port-packed cargo on that route without exceeding the Army's FY 84 total allocation for unsubscribed airlift. The routes were filled by priority based upon the route that contributed the largest positive cost avoidance per MTON lifted. Table E-6 illustrates that a cost avoidance of $217,938 could be realized through this redistribution. This was accomplished by expanding the Army's unsubscribed capacity allocation on the Norfolk to Sigonella and Travis to Yokata/Osan routes. Seventy-eight percent of the total cost avoidance was netted from the Norfolk-Sigonella expansion.

Table E-6. Transportation Cost Avoidance - Reallocation

Route	CA	=	MTON diverted	x	(S-A)[a]	+ ½ A (MTON of HHG)	
Norfolk-Sigonella	147,626	=	3,796	x	(161.77-122.88)		
Travis-Yokota	12,399	=	1,126	x	(87.30-76.80)	+ ½ (76.80)	15
Travis-Osan	9,877	=	6,950	x	(90.45-90.00)	+ ½ (90.00)	150
Other routes from Table E-4	48,036						
Total	217,938						

[a]S = surface transportation cost ($/MTON), A = airlift transportation cost ($/MTON).

d. The second sensitivity analysis was performed to achieve total utilization of the Army's projected allocation of unsubscribed capacity for FY 84 by route. In this analysis, container compatible cargoes other than surface port-packed cargoes were diverted to fill the Army's allocation per route (Table E-7). As indicated in paragraph 7-2c, Chapter 7, air-eligible challenge cargo was diverted first because the cost challenge for TP-4 airlift is not as relevant. Table E-8 depicts the amount of air-challenged cargo available for rediversion from surface lift to TP-4 airlift for FY 83. Included in these totals are ALOC air-challenge data which was isolated and is depicted in Table E-9. The remaining amount of unsubscribed airlift capacity was then filled with source-packed containerized cargo. As shown in Table E-7, the total cost avoidance from diverting these cargoes was $41,493. Diverting source-packed cargo to airlift on all routes except Dover to Dhahran and Norfolk to Bahrain produced negative cost avoidances or additional transportation costs to the Army. However, due to the large cost avoidance from diverting surface cargo to airlift on the routes named above, the overall cost avoidance remains positive.

Table E-7. Transportation Cost Avoidance - Capacity Filled

Route	CA	=	CA_p[a]	+	(Challenged cargo	+	Other cargo)	x	(S-A)[b]
Dover-Rhein Main/Ramstein	(22,039)	=	34,538	+	(4,890	+	0)	x	(98.43-110.40)
Dover-Incirlik	(1,216)	=	6,084	+	(9	+	243)	x	(169.03-198.00)
Travis-Yokota/Osan	11,625	=	11,625	+	(0	+	0)	x	(67.95-90.00)
Travis-Kadena	(3,171)	=	5,446	+	(7	+	72)	x	(85.60-114.40)
Dover-Dhahran	63,361	=	1,719	+	(12	+	854)	x	(281.18-210.00)
Norfolk-Sigonella	1,202	=	1,202	+	(0	+	0)	x	(124.98-122.88)
Norfolk-Bahrain	854	=	0	+	(0	+	12)	x	(281.18-210.00)
Travis-Clark	(2,764)	=	127	+	(95	+	60)	x	(98.00-79.35)
Travis-Germany	(587)	=	122	+	(322	+	0)	x	(128.20-130.40)
Charleston-Howard	(5,029)	=	0	+	(580	+	0)	x	(64.53-73.20)
Travis-Hickam	(743)	=	(743)	+	(0	+	0)	x	(70.20-95.20)
Total	41,493								

[a] CA_p = cost avoidance generated by diverting port-packed cargoes (Table E-5).

[b] S = surface transportation ($/MTON), A = airlift transportation ($/MTON).

Table E-8. FY 83 Air-challenged Cargo Data
(page 1 of 2 pages)

Month	STON	MTON	$ Savings
		Germany	
Oct	931	2,160	$ 2,351,658
Nov	875	2,030	2,285,979
Dec	1,101	2,554	2,821,277
Jan	858	1,991	2,461,185
Feb	504	1,169	1,376,380
Mar	771	1,789	2,056,459
Apr	986	2,288	2,423,762
May	739	1,714	1,774,593
Jun	734	1,703	1,805,273
Jul	1,010	2,343	2,366,281
Aug	870	2,018	2,008,784
Sep	1,581	3,668	3,696,438
		Korea	
Oct	59	137	200,936
Nov	61	142	127,405
Dec	70	162	186,700
Jan	72	167	193,117
Feb	106	246	318,167
Mar	95	220	244,225
Apr	88	204	223,264
May	83	193	244,133
Jun	116	269	348,089
Jul	157	364	478,453
Aug	104	241	377,263
Sep	73	169	284,277
		Japan	
Oct	17	39	60,281
Nov	18	42	38,222
Dec	21	49	56,010
Jan	22	51	57,935
Feb	32	74	95,450
Mar	29	67	73,267
Apr	26	60	66,979
May	25	58	73,240
Jun	35	81	104,427
Jul	47	109	143,536
Aug	31	72	113,179
Sep	22	51	85,283

Table E-8. FY 83 Air-challenged Cargo Data
(page 2 of 2 pages)

Month	STON	MTON	$ Savings
		Hawaii	
Oct	30	69	$ 100,468
Nov	31	71	63,703
Dec	35	81	93,350
Jan	36	89	96,559
Feb	53	123	159,089
Mar	48	110	122,113
Apr	44	102	111,632
May	42	97	122,067
Jun	58	135	174,045
Jul	79	182	239,227
Aug	52	121	188,632
Sep	37	85	142,139
		Panama	
Oct	9	21	11,354
Nov	47	109	51,836
Dec	20	46	26,267
Jan	1	2	2,091
Feb	25	58	28,791
Mar	2	5	3,413
Apr	60	139	44,461
May	15	35	11,359
Jun	20	46	16,439
Jul	3	7	3,074
Aug	15	35	11,920
Sep	66	153	95,097
		Neareast Asia	
Oct	4	9	13,913
Nov	88	204	269,582
Dec	0	0	0
Jan	1	2	2,091
Feb	1	2	2,332
Mar	1	2	3,355
Apr	0	0	0
May	0	0	0
Jun	0	0	0
Jul	1	2	1,491
Aug	3	7	9,718
Sep	4	9	12,762

Table E-9. FY 83 ALOC Air-challenged Cargo Data

Month	STON	MTON	ALOC Savings
		Germany	
Oct	436	550	$ 1,055,210
Nov	343	304	756,631
Dec	141	170	317,373
Jan	26	112	75,491
Feb	102	106	240,339
Mar	90	103	32,852
Apr	260	283	568,803
May	207	264	398.050
Jun	65	185	167,571
Jul	30	102	70,342
Aug	87	177	201,869
Sep	245	312	538,497
		Hawaii	
Oct	22	43	16,367
Nov	15	136	36,643
Dec	1	12	3,286
Jan	11	86	24,928
Feb	3	37	9,182
Mar	18	76	43,147
Apr	2	5	22,527
May	2	10	3,439
Jun	0	0	0
Jul	1	1	852
Aug	0	0	0
Sep	0	0	0
		Korea	
Oct	24	18	3,894
Nov	0	0	0
Dec	0	0	0
Jan	0	0	0
Feb	55	2	17,954
Mar	0	0	0
Apr	0	0	0
May	1	8	5,680
Jun	102	97	336,909
Jul	118	102	390,883
Aug	122	83	418,296
Sep	9	8	31,202

APPENDIX F

SURFACE ROUTE - COMMODITY ANALYSIS

F-1. GENERAL

a. The purpose of this appendix is to detail the steps that were performed to fill the Army's allocation of unsubscribed capacity for FY 84. The analysis discussion will consist of: (1) a listing of the surface port identifiers that were used to identify parallel surface routes, (2) a summary of port-packed cargoes eligible for diversion by amount and type, (3) an analysis of the surface commodities eligible for diversion by MILSTAMP transportation priority, and (4) the resulting transportation cost avoidance from the diversion of surface port-packed cargoes to airlift. The analysis discussion for the surface routes appears in this appendix as follows:

(1) New York to Germany.

(2) New York to Saudi Arabia.

(3) New York to Turkey.

(4) Norfolk to Spain and Italy.

(5) Norfolk to Bahrain.

(6) Charleston to Canal Zone.

(7) Oakland to Hawaii and Guam

(8) Oakland to Diego Garcia and Philippine Islands.

(9) Oakland to Okinawa.

(10) Oakland to Japan, Korea.

(11) Oakland to Germany.

b. The 11 surface routes were selected based upon the 11 air routes projected by MAC to contain unsubscribed air capacity. The surface routes that best parallel the given MAC incentive routes were selected for evaluation. The surface routes were formed by combining surface POEs and PODs in close proximity to APOEs and APODs. This was accomplished by selecting the first two digits of the surface POE and POD port identification code as found in MILSTAMP. For example, the port of New York was selected as a surface POE for the APOE of Dover. Since the New York port area is composed of several individual ports, all of the ports were aggregated into one POE. The surface POD was selected as the seaport closest to the aerial POD or the port that serves the APOD country.

c. The data base in this analysis is defined as all Army cargo loaded at terminals in CY 83. The data base was first divided into three transportation priorities (TP-1, TP-2, TP-3) and then defined as the amount of TP-1, 2, and 3 cargo commodities by each of the individual routes. The number of individual routes contained in each transportation priority are: TP-1 - 98, TP-2 - 157, and TP-3 - 374. Of the total number of individual routes contained in the data base, only 32 TP-1 routes, 46 TP-2 routes, and 70 TP-3 routes matched the 11 air routes. The output contains the routes, commodities per route, and weight and cube of each commodity by month.

(1) Table F-1 illustrates the routes that were utilized and lists the total amount of commodities by route and transportation priority. The total amount of all commodities on the 11 surface routes was 14,874 STON. The total amount of all commodities packed at surface ports for CY 83 was 94,258 STON.

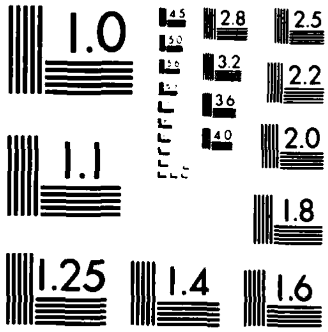
Table F-1. CY 83 Surface Commodity Tonnage/Transportation Priority (STON)

Route	TP-1	TP-2	TP-3
New York to Germany	26.98	28.77	5,507.67
New York to Saudi Arabia		.80	.75
New York to Turkey	2.46	2.09	202.27
Norfolk to Spain, Italy	66.09	90.59	1,048.94
Norfolk to Bahrain	0	0	0
Charleston to Canal Zone	0	60.60	1,461.70
Oakland to Hawaii, Guam	2.55	64.25	696.52
Oakland to Diego Garcia, Philippines	0	0	7.74
Oakland to Okinawa	0	3.22	79.29
Oakland to Japan, Korea	152.62	159.48	4,239.89
Oakland to Germany	.92	1.55	1,027.38
Total (14,874.52)	251.62	350.75	14,272.15

(2) Table F-2 illustrates the Army's projected allocation of unsubscribed airlift capacity for each of the MAC-proposed routes. First, air-eligible, port-packed cargoes were listed in order of MILSTAMP transportation priority. Next, cargoes were selected in priority for diversion until the Army's allocation of unsubscribed capacity for that route was satisfied. If the amount of cargo eligible for diversion exceeded the amount of unsubscribed capacity on that route, the MADM technique (Appendix D) was employed to prioritize the cargoes.

AD-A148 669 UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC) STUDY(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD J A SORENSON ET AL. SEP 84 CAA-SR-84-29 2/3

UNCLASSIFIED F/G 15/5 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table F-2. FY 84 Unsubscribed Airlift Capacity Allocation - Army

Route	STON/year
Dover to Rhein Main/Ramstein	2,580
Dover to Dhahran	375
Dover to Incirlik	315
Norfolk to Rota/Sigonella	20
Norfolk to Rota/Bahrain	5
Charleston to Howard	250
Travis to Hickam/Guam	90
Travis to Subic Bay/Clark/Diego Garcia	75
Travis to Kadena	105
Travis to Yokota/Osan	500
Travis/Tinker to Europe	140

(3) The transportation cost avoidance was then calculated for each route. First, the surface commodities were converted to MTON equivalents using the data contained in the MTMC data base. Then, the amount of surface cargo eligible for diversion on that route was multiplied times the difference in surface and airlift transportation costs to compute the potential transportation cost avoidance. Finally, the routes were ranked in order of cost avoidance. (Note: The HHG TP4 rate is one-half the TP4 rate for that route per AFR 76-11.)

F-2. NEW YORK TO GERMANY

a. The following water port identifiers were used to develop a surface route to parallel the air route Dover-Rhein Main/Ramstein:

(1G1 to JF1)	(1G9 to JF6)	(1GC to JF6)
(1G3 to JF1)	(1G9 to JF1)	(1GH to JF1)
(1G6 to JF1)	(1GC to JF1)	(1GH to JF6)

Bayonne and Port Elizabeth accounted for 76 percent of cargo loaded at New York surface ports. Bremerhaven received 87 percent of the cargo delivered to Germany.

(1) The total amount of TP-1 cargo shipped on this route was 26.98 STON. Sixty-nine percent of this cargo was automotive and machine parts; the remaining cargo commodities are listed in Figure F-1. All cargo shipped was eligible for airlift in accordance with AR 59-3, Appendix C. One percent of the FY 85 Army quota of unsubscribed airlift capacity for this route was filled with TP-1 cargo.

(2) The total amount of TP-2 cargo shipped on this route was 28.77 STON. Seventy-one percent was paper products, and the remaining cargo commodities are listed on Figure F-1. The only commodity that cannot be diverted to air was the 1.34 STON of POV.

(3) The total amount of TP-3 cargo shipped on this route was 5,507.67 STON. Ninety-two percent of the TP-3 cargo was POVs, which cannot be diverted to airlift. The remaining commodities listed in Figure F-1 are divertible to airlift except for the 14 STON of paint and 8 STON of furniture. Possible justifications for their diversion are the potential savings that could be accrued from avoiding packing costs and the fact that the Dover-Rhein Main/Ramstein capacity was not satisfied.

(4) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	28	0
TP-2	0	27	0
TP-3	90	319	8
Total	90	374	8

Total - 472 STON/1,187 MTON
Route allocation - 2,580 STON

b. The sum of TP-1, TP-2, and TP-3 divertible commodities could have filled 22 percent of the FY 84 Army quota of unsubscribed airlift capacity. The total amount of divertible cargo on this route was 472.41 STON, leaving 2,108 STON of unfilled capacity on this route.

c. Cost avoidance for this route is as follows:

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ \text{(MTON)} \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 1,187 \times (125.22 - 110.40)$$

$$+ \text{ HHG cost avoidance (airlift) } 16,947$$

$$= 34,538$$

TP 1

• ROUTE = 1G JF   COMMOD = 581   SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.48	110.00
8306	2.76	770.00
8307	1.17	373.00
8308	2.32	900.00
8309	1.94	744.00
8312	1.00	372.00

• ROUTE = 1G JF   COMMOD = 592   SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	4.70	880.00
8310	2.61	800.00
8312	.42	140.00

• ROUTE = 1G JF   COMMOD = 700   SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	1.73	400.00
8304	.87	200.00
8310	.01	4.00

• ROUTE = 1G JF   COMMOD = 659   SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.53	84.00
8302	.58	46.00
8303	.81	140.00

• ROUTE = 1G JF   COMMOD = 530   SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.05	10.00
8303	1.24	186.00

• ROUTE = 1G JF   COMMOD = 591   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	1.20	312.00

• ROUTE = 1G JF   COMMOD = 576   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.70	78.00

• ROUTE = 1G JF   COMMOD = 635   SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.03	2.00
8302	.23	16.00
8303	.17	33.00
8305	.25	19.00

• ROUTE = 1G JF   COMMOD = 574   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.48	69.00

• ROUTE = 1G JF   COMMOD = 634   SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.13	20.00
8305	.25	16.00

• ROUTE = 1G JF   COMMOD = 582   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.25	16.00

• ROUTE = 1G JF   COMMOD = 732   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.05	9.00

• ROUTE = 1G JF   COMMOD = 450   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.02	1.00

TP 2

• ROUTE = 1G JF   COMMOD = 721   SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	20.55	1165.00

• ROUTE = 1G JF   COMMOD = 635   SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.45	59.00
8302	.94	59.00
8303	.43	44.00
8304	.08	16.00
8305	.00	1.00
8308	.01	1.00

Figure F-1. New York to Germany Cargo Distribution List
(page 1 of 7 pages)

```
* ROUTE = 1G JF    COMMOD = 591   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8302                 1.82              222.00

* ROUTE = 1G JF    COMMOD = 320   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8309                 1.34              432.00

* ROUTE = 1G JF    COMMOD = 701   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8303                  .72               54.00

* ROUTE = 1G JF    COMMOD = 757   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8303                  .41               62.00

* ROUTE = 1G JF    COMMOD = 582   SHP MTHS = 5
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8301                  .15               11.00
  8302                  .01                3.00
  8303                  .20               21.00
  8304                  .02                2.00
  8309                  .00                1.00

* ROUTE = 1G JF    COMMOD = 712   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8310                  .04               14.00
  8311                  .30              155.00

* ROUTE = 1G JF    COMMOD = 370   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8311                  .04               10.00
  8312                  .25               62.00

* ROUTE = 1G JF    COMMOD = 391   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8311                  .22               80.00

* ROUTE = 1G JF    COMMOD = 530   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8303                  .19               17.00
  8309                  .01                1.00

* ROUTE = 1G JF    COMMOD = 581   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8302                  .13               37.00
  8311                  .06               32.00

* ROUTE = 1G JF    COMMOD = 634   SHP MTHS = 3
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8302                  .08                4.00
  8303                  .02                4.00
  8305                  .03                3.00

* ROUTE = 1G JF    COMMOD = 574   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8310                  .12                3.00

* ROUTE = 1G JF    COMMOD = 700   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8307                  .01                1.00
  8312                  .07               18.00

* ROUTE = 1G JF    COMMOD = 744   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8312                  .33                8.00

* ROUTE = 1G JF    COMMOD = 576   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8306                  .01                1.00

* ROUTE = 1G JF    COMMOD = 658   SHP MTHS = 2
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8307                  .00                1.00
  8311                  .01                2.00

* ROUTE = 1G JF    COMMOD = 142   SHP MTHS = 1
  YRMO        WEIGHT (TONS)      VOLUME (CU FT)
  8305                  .01               10.00
```

Figure F-1. New York to Germany Cargo Distribution List
(page 2 of 7 pages)

• ROUTE = 1G JF COMMOD = 585 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00

TP3

• ROUTE = 1G JF COMMOD = 720 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	35.59	10499.00
8302	165.53	47857.00
8303	542.08	156037.00
8304	22.91	6456.00
8305	5.18	1393.00
8306	244.54	71744.00
8307	1175.52	336854.00
8308	1171.71	328591.00
8309	696.30	193722.00
8310	787.10	227700.00
8311	61.85	17721.00
8312	63.57	18259.00

• ROUTE = 1G JF COMMOD = 350 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	8.12	2735.00
8303	18.75	6458.00
8306	5.85	1564.00
8307	10.79	3590.00
8308	12.60	4301.00
8309	16.91	5130.00
8310	19.36	7013.00

• ROUTE = 1G JF COMMOD = 390 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	15.48	4101.00
8302	9.00	2477.00
8303	6.01	1773.00
8304	2.81	885.00
8305	4.56	1184.00
8306	4.26	1170.00
8307	2.62	799.00
8308	13.01	3577.00
8309	9.07	2380.00
8310	6.96	1985.00
8311	7.10	2172.00
8312	6.05	1495.00

• ROUTE = 1G JF COMMOD = 700 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.74	111.00
8302	.52	54.00
8303	.35	107.00
8304	.45	51.00
8305	13.00	452.00
8306	2.60	361.00
8307	26.29	1251.00
8308	.04	9.00
8309	.32	85.00
8310	30.89	3964.00
8311	.51	110.00
8312	.46	107.00

• ROUTE = 1G JF COMMOD = 764 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	36.00	3200.00
8309	3.61	270.00

• ROUTE = 1G JF COMMOD = 635 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.43	276.00
8302	21.35	1675.00
8303	9.54	695.00
8304	2.46	251.00
8305	1.29	135.00
8306	.02	5.00
8307	.09	6.00
8308	.18	10.00
8309	.04	11.00
8311	.19	25.00
8312	.52	66.00

• ROUTE = 1G JF COMMOD = 518 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	22.26	1332.00
8312	14.47	867.00

• ROUTE = 1G JF COMMOD = 701 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.55	128.00
8303	1.21	106.00
8305	1.87	120.00
8306	.86	60.00
8307	1.82	103.00
8309	3.30	222.00
8310	3.68	281.00
8311	.27	17.00
8312	4.86	303.00

• ROUTE = 1G JF COMMOD = 578 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	19.65	525.00

• ROUTE = 1G JF COMMOD = 621 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	9.73	427.00
8312	4.16	339.00

Figure F-1. New York to Germany Cargo Distribution List
(page 3 of 7 pages)

• ROUTE = 1G JF COMMOD = 729 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.50	443.00
8303	.13	22.00
8304	1.48	116.00
8306	1.80	338.00
8307	.32	72.00
8309	.37	32.00
8310	.47	234.00
8311	1.60	180.00

• ROUTE = 1G JF COMMOD = 737 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.26	30.00
8305	2.93	370.00
8306	2.45	250.00
8307	3.25	635.00
8310	.07	7.00

• ROUTE = 1G JF COMMOD = 800 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	7.50	1200.00

• ROUTE = 1G JF COMMOD = 712 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.66	354.00
8303	.12	25.00
8305	.03	12.00
8310	.03	15.00
8311	4.77	1701.00
8312	.49	175.00

• ROUTE = 1G JF COMMOD = 592 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.65	200.00
8308	6.06	286.00

• ROUTE = 1G JF COMMOD = 603 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	6.53	460.00

• ROUTE = 1G JF COMMOD = 704 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.79	60.00
8303	.14	40.00
8306	.77	113.00
8307	2.94	367.00
8308	.72	50.00
8312	.61	61.00

• ROUTE = 1G JF COMMOD = 340 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.26	125.00
8303	1.20	340.00
8307	.89	245.00
8308	.81	270.00
8309	1.10	260.00
8310	.61	215.00
8311	.45	110.00

• ROUTE = 1G JF COMMOD = 530 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.20	129.00
8303	3.93	322.00

• ROUTE = 1G JF COMMOD = 721 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.54	145.00
8306	.14	21.00
8307	.50	110.00
8308	.51	250.00
8309	.43	80.00
8310	1.17	160.00
8312	1.73	152.00

• ROUTE = 1G JF COMMOD = 585 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.01	55.00
8303	.37	19.00
8304	.01	2.00
8305	.01	2.00
8311	3.46	850.00

• ROUTE = 1G JF COMMOD = 352 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.94	780.00
8309	1.84	690.00

• ROUTE = 1G JF COMMOD = 634 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.15	81.00
8302	.39	32.00
8303	1.18	117.00
8305	.33	39.00
8309	.07	3.00
8310	.31	1.00
8311	.26	22.00
8312	.08	12.00

Figure F-1. New York to Germany Cargo Distribution List
(page 4 of 7 pages)

* ROUTE = 1G JF COMMOD = 723 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.20	200.00
8310	.20	40.00

* ROUTE = 1G JF COMMOD = 543 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.95	170.00

* ROUTE = 1G JF COMMOD = 622 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	2.94	186.00

* ROUTE = 1G JF COMMOD = 591 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.80	175.00
8305	1.70	360.00
8310	.10	42.00
8312	.23	32.00

* ROUTE = 1G JF COMMOD = 582 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.06	8.00
8302	.04	12.00
8303	.23	35.00
8304	.48	29.00
8305	.17	13.00
8306	.01	2.00
8307	.52	21.00
8308	.00	1.00
8309	.53	43.00
8310	.11	10.00
8312	.01	1.00

* ROUTE = 1G JF COMMOD = 631 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.24	126.00
8303	.34	26.00
8305	.16	11.00

* ROUTE = 1G JF COMMOD = 753 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.28	44.00
8304	.18	104.00
8305	.31	60.00
8306	.46	173.00
8309	.38	112.00

* ROUTE = 1G JF COMMOD = 420 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.53	461.00

* ROUTE = 1G JF COMMOD = 391 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.62	166.00
8304	.19	75.00
8306	.47	86.00

* ROUTE = 1G JF COMMOD = 581 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.76	32.00
8307	1.17	373.00

* ROUTE = 1G JF COMMOD = 732 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.66	81.00
8304	.54	55.00

* ROUTE = 1G JF COMMOD = 725 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.98	236.00

* ROUTE = 1G JF COMMOD = 735 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00
8312	.86	250.00

* ROUTE = 1G JF COMMOD = 757 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	4.00
8304	.12	20.00
8307	.50	45.00
8310	.19	24.00
8312	.01	2.00

* ROUTE = 1G JF COMMOD = 752 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.73	164.00
8303	.13	10.00

Figure F-1. New York to Germany Cargo Distribution List
(page 5 of 7 pages)

• ROUTE = 16 JF COMMOD = 702 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.28	63.00
8310	.53	108.00

• ROUTE = 16 JF COMMOD = 560 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.72	53.00

• ROUTE = 16 JF COMMOD = 370 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.26	60.00
8309	.41	114.00

• ROUTE = 16 JF COMMOD = 733 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.18	58.00
8309	.31	130.00
8311	.14	40.00

• ROUTE = 16 JF COMMOD = 608 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8[illegible]1	.11	10.00
8312	.41	40.00

• ROUTE = 16 JF COMMOD = 65A SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.18	20.00
8304	.14	31.00
8306	.06	15.00
8309	.04	10.00

• ROUTE = 16 JF COMMOD = 713 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.30	32.00
8311	.02	2.00

• ROUTE = 16 JF COMMOD = 630 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.36	36.00
8303	.05	5.00

• ROUTE = 16 JF COMMOD = 450 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.06	8.00
8304	.03	5.00
8307	.04	6.00
8309	.05	7.00
8310	.03	3.00
8312	.01	1.00

• ROUTE = 16 JF COMMOD = 765 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.12	18.00
8303	.00	1.00
8304	.04	6.00
8307	.05	7.00

• ROUTE = 16 JF COMMOD = 491 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.06	19.00
8309	.14	32.00
8312	.00	1.00

• ROUTE = 16 JF COMMOD = 772 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.19	20.00

• ROUTE = 16 JF COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.18	20.00
8312	.00	1.00

• ROUTE = 16 JF COMMOD = 855 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.17	19.00

• ROUTE = 16 JF COMMOD = 436 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.17	60.00

• ROUTE = 16 JF COMMOD = 658 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	2.00
8307	.00	2.00
8311	.04	11.00
8312	.12	40.00

Figure F-1. New York to Germany Cargo Distribution List
(page 6 of 7 pages)

• ROUTE = 1G JF COMMOD = 724 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.00	1.00
8304	.13	25.00
8305	.00	1.00
8307	.00	1.00

• ROUTE = 1G JF COMMOD = 734 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.09	14.00

• ROUTE = 1G JF COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.09	15.00

• ROUTE = 1G JF COMMOD = 500 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.08	16.00

• ROUTE = 1G JF COMMOD = 759 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.07	8.00

• ROUTE = 1G JF COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.34	8.00

• ROUTE = 1G JF COMMOD = 535 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.03	1.00

• ROUTE = 1G JF COMMOD = 754 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.01	1.00

• ROUTE = 1G JF COMMOD = 131 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.31	5.00

• ROUTE = 1G JF COMMOD = 756 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.01	2.00

• ROUTE = 1G JF COMMOD = 142 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.01	2.00
8306	.00	1.00

• ROUTE = 1G JF COMMOD = 534 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.01	1.00
8309	.00	1.00
8310	.00	1.00

• ROUTE = 1G JF COMMOD = 660 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00

• ROUTE = 1G JF COMMOD = 495 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.00	2.00

• ROUTE = 1G JF COMMOD = 681 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	2.00

• ROUTE = 1G JF COMMOD = 623 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.00	1.00

Figure F-1. New York to Germany Cargo Distribution List
(page 7 of 7 pages)

F-3. NEW YORK TO SAUDI ARABIA

a. The following water port identifiers were used to develop a surface route to parallel the air route Dover to Dhahran: 1G9 to PF3 and 1G9 to PP1. The main ports used to analyze this route were Port Elizabeth, NJ to Damman, Saudi Arabia.

(1) There was no cargo shipped as TP-1, and the total amount of TP-2 cargo shipped on this route was .80 STON consisting entirely of HHG. Only .1 percent of the Army's FY 84 quota of unsubscribed airlift capacity for this air route could be filled by TP-2 cargo.

(2) The total amount of TP-3 cargo shipped on this surface route was .75 STON. All of the TP-3 cargo was general cargo, not otherwise specified (NOS). Only .1 percent of the Army's FY 84 quota of unsubscribed airlift capacity for this air route could be filled with TP-3 cargo.

(3) Summary of divertible cargo:

	HHG (STON)	**General (STON)**	**Special (STON)**
TP-1	0	0	0
TP-2	1	0	0
TP-3	0	0	0
Total	1	1	0

Total - 2 STON/13 MTON
Route allocation - 375 STON

b. The sum of the TP-1, TP-2, and TP-3 divertible commodities (Figure F-2) filled about .2 percent of the Army's FY 84 quota of unsubscribed airlift capacity. The total weight of cargo diverted on this surface route was 1.55 STON with a shortfall of 373 STON.

c. Cost avoidance for the route is as follows:

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ (\text{MTON}) \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 13 \times (317.97 - 210.00)$$

$$+ \text{ HHG cost avoidance (airlift) } 315$$

$$= 1{,}719$$

TP2

```
* ROUTE = 1G PF   COMMOD = 790  SHP MTHS =  1

YRMO          WEIGHT (TONS)       VOLUME (CU FT)
8309                    .80              147.00
```

TP3

```
* ROUTE = 1G PF   COMMOD = 700  SHP MTHS =  1

YRMO          WEIGHT (TONS)       VOLUME (CU FT)
8312                    .32              150.00

* ROUTE = 1G PF   COMMOD = 700  SHP MTHS =  1

YRMO          WEIGHT (TONS)       VOLUME (CU FT)
8312                    .43              200.00
```

Figure F-2. New York to Saudi Arabia Cargo Distribution List

F-4. NEW YORK TO TURKEY

a. The following water port identifiers were used to develop a surface route to parallel the air route Dover to Incirlik:

(1G1 to LR2)	(1G1 to LQ1)	(1GH to LR2)
(1G1 to LR1)	(1G9 to LR1)	(1GC to LR2)

The ports used to evaluate this route were New York to Izmin, Turkey and Bayonne, NJ to Istanbul, Turkey.

(1) The total amount of TP-1 cargo shipped on this route was 2.46 STON. Seventy-nine percent of the cargo was reels of wire rope; the remaining cargo commodities are listed in Figure F-3. Diversion of the TP-1 cargo would fill .8 percent of the Army's FY 84 quota of unsubscribed airlift capacity for this route.

(2) The total amount of TP-2 cargo shipped on this route was 2.09 STON. Thirty-three percent of the cargo was paints and compressed gas cylinders. The cargo commodities are listed on Figure F-3. The only commodity ineligible for diversion to airlift in accordance with AR 59-3, Appendix C, was the .25 STON of paint. The sum of TP-1 and TP-2 cargo filled percent of the Army's FY 84 quota of unsubscribed airlift capacity for this route.

(3) The total amount of TP-3 cargo shipped on this route was 202.27 STON. Twenty-five percent was paint and chemicals, and 34.4 percent was housewares and household products. The remaining cargo commodities are listed on Figure F-3. Although the paint and housewares are not air-eligible according to AR 59-3, Appendix C; possible justification for their diversion is warranted based on the potential cost savings from avoiding packing and the fact that the Dover-Incirlik route capacity was not satisfied.

(4) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	2	0
TP-2	0	3	0
TP-3	0	161	40
Total	0	166	40

Total - 206 STON/778 MTON
Route allocation - 315 STON

b. The sum of TP-1, TP-2, and TP-3 divertible commodities would fill 66 percent of the Army's FY 84 quota of unsubscribed airlift capacity. The total weight of cargo diverted on this surface route was 206.82 STON; 168.18 STON of unsubscribed capacity was not used.

c. Cost avoidance for the route is as follows:

$$\begin{aligned}\begin{matrix}\text{Cost}\\ \text{avoidance}\\ (\$)\end{matrix} &= \begin{matrix}\text{Divertible}\\ \text{cargo}\\ \text{(MTON)}\end{matrix} \times \left(\begin{matrix}\text{Surface}\\ \text{transportation}\\ (\$/\text{MTON})\end{matrix} - \begin{matrix}\text{Airlift}\\ \text{transportation}\\ (\$/\text{MTON})\end{matrix}\right)\\ &= 778 \times (205.82 - 198.00)\\ &= 6{,}084\end{aligned}$$

TP1

• ROUTE = 1G LR COMMOD = 745 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	1.96	130.00

• ROUTE = 1G LR COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.44	25.00

• ROUTE = 1G LR COMMOD = 142 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.06	4.00

TP2

• ROUTE = 1G LR COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.49	29.00

• ROUTE = 1G LR COMMOD = 635 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.43	32.00

• ROUTE = 1G LR COMMOD = 582 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.34	11.00

• ROUTE = 1G LR COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.31	112.00

• ROUTE = 1G LR COMMOD = 620 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.25	23.00

• ROUTE = 1G LR COMMOD = 574 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.14	9.00

• ROUTE = 1G LR COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.01	2.00
8307	.07	9.00

• ROUTE = 1G LR COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.04	5.00

• ROUTE = 1G LR COMMOD = 756 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	1.00

• ROUTE = 1G LR COMMOD = 131 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.00	1.00

• ROUTE = 1G LR COMMOD = 142 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

• ROUTE = 1G LR COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.00	1.00

TP3

• ROUTE = 1G LC COMMOD = 700 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	4.00	891.00
8310	.10	9.00

• ROUTE = 1G LR COMMOD = 867 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.20	360.00
8309	3.30	1440.00
8310	24.48	8780.00
8311	2.00	730.00

• ROUTE = 1G LR COMMOD = 635 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.19	217.00
8305	3.01	223.00
8306	.06	6.00
8308	5.41	279.00
8309	.05	3.00
8310	6.80	423.00
8311	3.49	255.00

Figure F-3. New York to Turkey Cargo Distribution List
(page 1 of 5 pages)

• ROUTE = 1G LA COMMOD = 700 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.70	121.00
8302	.09	22.00
8303	.32	64.00
8304	.64	91.00
8305	.16	10.00
8306	3.27	288.00
8307	.04	12.00
8308	6.02	870.00
8309	3.76	589.00
8310	2.06	278.00
8311	2.90	468.00

• ROUTE = 1G LA COMMOD = 620 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.68	247.00
8305	7.45	395.00
8308	3.60	243.00
8310	.63	50.00
8311	.13	17.00

• ROUTE = 1G LA COMMOD = 713 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.14	4.00
8304	.00	1.00
8308	2.26	100.00
8309	.04	1.00
8310	11.09	848.00
8311	.15	45.00

• ROUTE = 1G LA COMMOD = 730 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.51	56.00
8303	1.92	150.00
8304	.47	74.00
8306	1.82	171.00
8307	.05	4.00
8308	.45	45.00
8310	.11	23.00
8311	5.81	461.00

• ROUTE = 1G LA COMMOD = 621 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.43	191.00
8302	.10	7.00
8304	.08	14.00
8305	5.10	260.00
8306	.13	13.00
8307	.05	4.00
8308	.41	26.00
8310	.14	13.00
8311	.44	37.00

• ROUTE = 1G LA COMMOD = 721 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.53	121.00
8306	2.85	235.00
8308	3.11	423.00
8310	1.03	85.00
8311	.20	18.00

• ROUTE = 1G LA COMMOD = 530 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	7.30	290.00
8305	.71	43.00
8308	.10	16.00
8313	.19	34.00

• ROUTE = 1G LA COMMOD = 753 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	11.00
8303	.78	140.00
8310	.11	31.00
8311	6.61	647.00

• ROUTE = 1G LA COMMOD = 879 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.40	740.00
8308	2.30	720.00
8313	1.15	360.00

• ROUTE = 1G LA COMMOD = 556 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	4.90	400.00

• ROUTE = 1G LA COMMOD = 658 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.03	4.00
8303	3.81	242.00
8304	.05	2.00
8305	.00	1.00
8306	.05	6.00
8307	.12	32.00
8308	.02	5.00
8309	.05	4.00

Figure F-3. New York to Turkey Cargo Distribution List
(page 2 of 5 pages)

* ROUTE = 16 LA COMMOD = 764 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.20	1.00
8307	.15	16.00
8308	.05	5.00
8309	.02	1.00
8310	2.37	426.00
8311	1.36	124.00

* ROUTE = 16 LA COMMOD = 450 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.88	154.00
8305	.01	1.00
8308	.01	2.00
8311	.43	29.00

* ROUTE = 16 LA COMMOD = 659 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.33	96.00
8305	2.97	2219.00

* ROUTE = 16 LA COMMOD = 634 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.23	28.00
8305	1.11	97.00
8308	1.20	115.00
8311	.63	41.00

* ROUTE = 16 LA COMMOD = 705 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.15	15.00
8303	.00	1.00
8304	.00	2.00
8305	1.27	64.00
8306	.01	1.00
8307	.01	3.00
8308	1.48	60.00

* ROUTE = 16 LA COMMOD = 560 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	2.84	184.00

* ROUTE = 16 LA COMMOD = 582 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	3.00
8305	.08	5.00
8308	1.71	306.00
8309	.19	9.00
8310	.00	1.00
8311	.55	61.00

* ROUTE = 16 LA COMMOD = 894 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	1.95	720.00

* ROUTE = 16 LA COMMOD = 743 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.56	36.00
8306	.02	2.00
8308	.35	18.00
8310	.03	3.00
8311	.68	35.00

* ROUTE = 16 LA COMMOD = 700 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.07	8.00
8311	1.34	67.00

* ROUTE = 16 LA COMMOD = 772 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.05	6.00
8308	.05	6.00
8309	1.31	177.00

* ROUTE = 16 LA COMMOD = 757 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.10	17.00
8310	.52	36.00
8311	.35	25.00

* ROUTE = 16 LA COMMOD = 660 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.89	45.00

* ROUTE = 16 LA COMMOD = 576 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	2.00
8304	.59	65.00
8305	.14	9.00
8307	.04	11.00
8308	.01	2.00
8310	.00	3.00

* ROUTE = 16 LA COMMOD = 712 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.50	43.00

Figure F-3. New York to Turkey Cargo Distribution List
(page 3 of 5 pages)

* ROUTE = 16 LF COMMOD = 534 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.07	26.00
8307	.36	5.00
8309	.04	10.00

* ROUTE = 16 LF COMMOD = 729 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.08	50.00
8308	.37	70.00

* ROUTE = 16 LF COMMOD = 623 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.33	15.00
8305	.09	14.00
8310	.00	1.00

* ROUTE = 16 LF COMMOD = 631 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.13	5.00
8311	.27	21.00

* ROUTE = 16 LF COMMOD = 732 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8303	.02	5.00
8304	.00	1.00
8305	.01	1.00
8306	.01	5.00
8308	.33	46.00
8310	.00	1.00
8311	.00	1.00

* ROUTE = 16 LF COMMOD = 761 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.27	142.00

* ROUTE = 16 LF COMMOD = 724 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.05	10.00
8304	.08	26.00
8308	.07	12.00

* ROUTE = 16 LF COMMOD = 766 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.05	7.00
8304	.13	13.00
8308	.00	1.00

* ROUTE = 16 LF COMMOD = 728 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.13	16.00
8311	.02	4.00

* ROUTE = 16 LF COMMOD = 606 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.15	6.00

* ROUTE = 16 LF COMMOD = 630 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.14	5.00

* ROUTE = 16 LF COMMOD = 752 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.12	30.00

* ROUTE = 16 LF COMMOD = 131 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.03	4.00
8309	.09	5.00

* ROUTE = 16 LF COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.11	90.00

* ROUTE = 16 LF COMMOD = 725 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.10	35.00

* ROUTE = 16 LF COMMOD = 733 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.07	10.00

* ROUTE = 16 LF COMMOD = 710 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.02	1.00
8311	.03	2.00

* ROUTE = 16 LF COMMOD = 532 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.05	15.00

Figure F-3. New York to Turkey Cargo Distribution List (page 4 of 5 pages)

```
* ROUTE = 16 LR   COMMOD = 756   SHP MTHS = 4
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8304                    .01                1.00
8305                    .01                1.00
8308                    .01                1.00
8311                    .01                1.00

* ROUTE = 16 LR   COMMOD = 585   SHP MTHS = 3
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8305                    .02                2.00
8308                    .01                2.00
8311                    .01                2.00

* ROUTE = 16 LR   COMMOD = 609   SHP MTHS = 2
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8308                    .03                1.00
8310                    .01                2.00

* ROUTE = 16 LR   COMMOD = 605   SHP MTHS = 1
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8310                    .02                2.00

* ROUTE = 16 LR   COMMOD = 603   SHP MTHS = 2
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8301                    .01                1.00
8305                    .01                2.00

* ROUTE = 16 LR   COMMOD = 703   SHP MTHS = 1
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8304                    .02                7.00

* ROUTE = 16 LR   COMMOD = 706   SHP MTHS = 2
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8301                    .00                2.00
8311                    .01                2.00

* ROUTE = 16 LR   COMMOD = 436   SHP MTHS = 1
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8308                    .01                1.00

* ROUTE = 16 LR   COMMOD = 142   SHP MTHS = 2
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8304                    .00                2.00
8306                    .01                2.00

* ROUTE = 16 LR   COMMOD = 604   SHP MTHS = 1
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8306                    .01                1.00

* ROUTE = 16 LR   COMMOD = 581   SHP MTHS = 1
YRMO          WEIGHT (TONS)      VOLUME (CU FT)
8305                    .00                2.00
```

Figure F-3. New York to Turkey Cargo Distribution List
(page 5 of 5 pages)

F-5. NORFOLK TO SPAIN AND ITALY

a. The following water port identifiers were used to develop a surface route to parallel the air route Norfolk-Rota/Sigonella:

(1M1 to KJ1)	(1M1 to KJ2)	(1M1 to KF3)	(1M2 to KF1)
(1M1 to KJ3)	(1M1 to KF1)	(1M1 to KF4)	(1M2 to KF3)

The ports used to analyze this route were Norfolk to Rota, Spain, and Norfolk to Naples, Italy.

(1) The total amount of TP-1 cargo shipped on this route was 66.09 STON, all destined for Sigonella. Seventy-eight percent of the TP-1 cargo shipments were lumber products and 19 percent were household appliances. The FY 84 Army quota of unsubscribed airlift capacity is only 20 STON. Thus, the eligible TP-1 cargoes on this route must be prioritized for diversion using the MADM technique discussed in Appendix D. The results of the prioritization process indicated that the preferred alternative for diversion was lumber products. A sufficient amount of lumber products was available to satisfy the Army's route capacity allocation; therefore, household appliances were not considered.

(2) Additionally, 91 STON of TP-2 cargo and 1,048 STON of TP-3 cargo were eligible but not selected for diversion (Figure F-4).

(3) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	32	0
TP-2	0	96	0
TP-3	29	828	5
Total	29	966	5

Total - 1,000 STON/3,796 MTON
Route allocation - 20 STON

b. Cost avoidance for the route is as follows:

$$\text{Cost avoidance (\$)} = \text{Divertible cargo (MTON)} \times \left(\text{Surface transportation (\$/MTON)} - \text{Airlift transportation (\$/MTON)}\right)$$

$$= 31 \times (161.77 - 122.88)$$

$$= 1,206$$

TP1

• ROUTE = 1M KF COMMOD = 559 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	51.73	2874.00

• ROUTE = 1M KF COMMOD = 752 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	6.46	1849.00

• ROUTE = 1M KF COMMOD = 725 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	3.62	1082.00
8311	2.21	636.00

• ROUTE = 1M KF COMMOD = 524 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.51	30.00

• ROUTE = 1M KF COMMOD = 635 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.44	83.00

• ROUTE = 1M KF COMMOD = 513 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.35	21.00

• ROUTE = 1M KF COMMOD = 516 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.34	20.00

• ROUTE = 1M KF COMMOD = 500 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.13	16.00

• ROUTE = 1M KF COMMOD = 509 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.36	3.00

• ROUTE = 1M KF COMMOD = 525 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.34	2.00

• ROUTE = 1M KF COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.00	1.00

TP2

• ROUTE = 1M KF COMMOD = 664 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	6.76	518.00
8308	3.32	340.00
8309	29.12	1495.00
8310	3.57	255.00

• ROUTE = 1M KF COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	20.38	1222.00

• ROUTE = 1M KF COMMOD = 741 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.97	126.00
8302	.60	70.00
8303	6.30	1000.00
8309	.23	50.00

• ROUTE = 1M KF COMMOD = 576 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	4.00
8308	6.73	606.00
8310	.03	11.00

• ROUTE = 1M KF COMMOD = 700 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.08	3.00
8303	2.28	264.00
8304	.78	113.00
8306	2.05	389.00
8311	.13	7.00

• ROUTE = 1M KF COMMOD = 560 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.82	107.00

• ROUTE = 1M KF COMMOD = 390 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.35	70.00
8304	.15	60.00
8310	1.24	362.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 1 of 8 pages)

• ROUTE = 1M KF COMMOD = 752 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	1.04	135.00

• ROUTE = 1M KF COMMOD = 582 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.58	25.00
8302	.13	4.00
8305	.04	2.00
8307	.10	4.00

• ROUTE = 1M KF COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.55	82.00

• ROUTE = 1M KF COMMOD = 620 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.34	6.00
8307	.28	27.00

• ROUTE = 1M KF COMMOD = 142 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00
8307	.01	2.00
8309	.30	83.00

• ROUTE = 1M KF COMMOD = 635 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.13	16.00
8302	.01	4.00
8306	.06	5.00
8309	.01	1.00
8310	.00	1.00

• ROUTE = 1M KF COMMOD = 530 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	2.00
8306	.15	16.00

• ROUTE = 1M KF COMMOD = 450 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.10	4.00

• ROUTE = 1M KF COMMOD = 603 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.06	3.00

• ROUTE = 1M KF COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.03	4.00

• ROUTE = 1M KF COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.03	7.00

• ROUTE = 1M KF COMMOD = 534 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.00	1.00
8312	.03	8.00

• ROUTE = 1M KF COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.01	4.00

• ROUTE = 1M KF COMMOD = 621 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.00	1.00

• ROUTE = 1M KF COMMOD = 706 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 1M KF COMMOD = 491 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.00	1.00

TP3

• ROUTE = 1M KJ COMMOD = 320 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.55	300.00
8304	1.00	300.00
8305	1.65	500.00
8307	.30	85.00
8310	4.86	1396.00
8311	1.10	323.00
8312	2.99	993.00

Figure F-4. Norfolk to Italy Cargo Distribution List (page 2 of 8 pages)

• ROUTE = 1M KJ COMMOD = 686 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	7.25	350.00

• ROUTE = 1M KJ COMMOD = 350 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	2.54	625.00
8307	2.10	750.00

• ROUTE = 1M KJ COMMOD = 879 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.30	373.00
8309	1.62	437.00

• ROUTE = 1M KJ COMMOD = 390 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.92	279.00

• ROUTE = 1M KJ COMMOD = 621 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.21	5.00

• ROUTE = 1M KE COMMOD = 700 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.28	96.00
8308	.16	33.00

• ROUTE = 1M KE COMMOD = 572 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.40	3.00

• ROUTE = 1M KE COMMOD = 340 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.38	140.00

• ROUTE = 1M KE COMMOD = 741 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.06	15.00

• ROUTE = 1M KF COMMOD = 576 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.55	77.00
8302	.03	2.00
8303	.02	3.00
8304	29.21	1398.00
8305	8.64	180.00
8306	72.39	1503.00
8307	61.87	1344.00
8309	16.60	371.00
8310	61.43	1225.00
8311	.01	3.00

• ROUTE = 1M KF COMMOD = 320 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	14.40	3817.00
8302	13.39	4132.00
8303	4.91	1355.00
8304	15.36	4357.00
8305	4.23	1156.00
8306	17.43	5175.00
8307	3.71	1078.00
8308	15.21	4447.00
8309	7.25	1876.00
8310	37.68	10721.00
8311	1.68	453.00
8312	20.72	5820.00

• ROUTE = 1M KF COMMOD = 560 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.45	80.00
8303	3.46	225.00
8304	50.60	3129.00
8306	3.02	171.00
8307	11.05	609.00
8308	1.13	203.00
8309	48.30	2580.00

• ROUTE = 1M KF COMMOD = 712 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	33.71	5904.00
8302	58.65	9008.00
8303	18.55	3795.00
8304	.97	204.00
8306	3.33	1935.00

• ROUTE = 1M KF COMMOD = 559 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.02	112.00
8304	15.81	900.00
8305	12.04	669.00
8306	13.66	760.00
8307	4.84	256.00
8309	20.77	1158.00
8312	5.20	290.00

Figure F-4. Norfolk to Italy Cargo Distribution List (page 3 of 8 pages)

• ROUTE = 1M KF COMMOD = 741 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	17.86	3993.00
8305	1.53	306.00
8306	2.12	911.00
8307	5.59	796.00
8308	3.72	592.00
8309	11.70	2165.00
8310	.56	84.00
8312	3.36	484.00

• ROUTE = 1M KF COMMOD = 700 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.50	651.00
8302	3.51	767.00
8303	1.56	369.00
8304	.92	124.00
8305	.08	13.00
8306	1.86	366.00
8307	5.09	121.00
8308	.77	233.00
8309	2.58	373.00
8310	.67	520.00
8311	6.58	2066.00
8312	7.40	922.00

• ROUTE = 1M KF COMMOD = 350 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.45	600.00
8304	3.10	1119.00
8305	2.22	652.00
8306	3.45	1185.00
8307	4.20	1481.00
8310	12.60	3663.00
8312	1.28	454.00

• ROUTE = 1M KF COMMOD = 790 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.06	266.00
8303	1.27	392.00
8304	2.82	719.00
8305	3.67	974.00
8306	5.33	1717.00
8306	2.67	801.00
8309	.80	244.00
8310	4.75	1389.00
8311	1.52	478.00
8312	1.61	423.00

• ROUTE = 1M KF COMMOD = 574 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.25	35.00
8309	24.11	467.00

• ROUTE = 1M KF COMMOD = 752 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.12	600.00
8304	18.39	5307.00

• ROUTE = 1M KF COMMOD = 635 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.36	240.00
8302	.98	41.00
8303	.10	8.00
8304	.47	52.00
8305	7.47	784.00
8306	2.47	174.00
8307	2.32	128.00
8308	1.43	86.00
8309	.33	25.00
8310	.24	17.00
8311	.05	4.00
8312	.98	30.00

• ROUTE = 1M KF COMMOD = 713 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.07	4.00
8304	.34	10.00
8305	.03	4.00
8306	.13	10.00
8307	.06	5.00
8308	.05	2.00
8310	14.51	302.00

• ROUTE = 1M KF COMMOD = 709 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.09	13.00
8304	8.53	1159.00
8306	.26	39.00
8307	.08	14.00
8309	.02	7.00
8312	1.38	222.00

• ROUTE = 1M KF COMMOD = 534 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	9.00
8302	.08	65.00
8303	4.25	674.00
8304	2.61	316.00
8306	.75	115.00
8309	1.37	237.00
8310	.00	1.00
8312	.07	16.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 4 of 8 pages)

• ROUTE = 1M KF COMMOD = 763 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	4.77	596.00
8304	.57	67.00
8306	.11	15.00
8307	.41	66.00
8309	.06	18.00
8310	.03	6.00
8312	3.19	736.00

• ROUTE = 1M KF COMMOD = 664 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	4.04	176.00
8310	3.93	337.00

• ROUTE = 1M KF COMMOD = 621 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.45	41.00
8302	.05	8.00
8303	.00	1.00
8304	.04	5.00
8307	.74	58.00
8309	1.31	100.00
8310	4.38	261.00

• ROUTE = 1M KF COMMOD = 772 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.69	234.00
8311	1.79	181.00
8312	2.82	392.00

• ROUTE = 1M KF COMMOD = 702 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.35	47.00
8306	1.45	250.00
8307	.19	36.00
8308	.77	145.00
8309	.62	147.00
8312	1.11	230.00

• ROUTE = 1M KF COMMOD = 634 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.21	27.00
8302	.21	9.00
8303	.03	4.00
8304	.23	22.00
8305	1.32	192.00
8306	1.32	192.00
8307	.01	1.00
8311	.32	22.00

• ROUTE = 1M KF COMMOD = 603 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.01	1.00
8305	1.25	75.00
8306	1.61	113.00
8310	.23	13.00

• ROUTE = 1M KF COMMOD = 795 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.60	1096.00

• ROUTE = 1M KF COMMOD = 530 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.10	18.00
8302	1.07	100.00
8304	.60	63.00
8306	.08	6.00
8307	.04	3.00
8309	.19	12.00
8310	.46	44.00

• ROUTE = 1M KF COMMOD = 620 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.85	51.00
8302	.02	1.00
8304	.14	10.00
8307	.21	17.00
8309	.73	53.00
8310	.33	24.00

• ROUTE = 1M KF COMMOD = 707 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	2.16	246.00

• ROUTE = 1M KF COMMOD = 609 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8306	1.58	102.00

• ROUTE = 1M KF COMMOD = 894 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	1.55	443.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 5 of 8 pages)

• ROUTE = 1M KF COMMOD = 658 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.14	19.00
8304	.02	3.00
8307	.05	4.00
8308	.60	151.00
8312	.16	48.00

• ROUTE = 1M KF COMMOD = 582 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.42	24.00
8303	.38	18.00
8305	.17	11.00
8309	.02	1.00
8310	.18	9.00
8312	.00	1.00

• ROUTE = 1M KF COMMOD = 586 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.14	10.00
8303	.16	35.00
8304	.12	14.00
8306	.03	9.00
8307	.13	16.00
8308	.02	9.00
8309	.50	34.00

• ROUTE = 1M KF COMMOD = 725 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.06	302.00

• ROUTE = 1M KF COMMOD = 592 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.23	19.00
8302	.05	8.00
8303	.10	6.00
8304	.14	10.00
8306	.11	8.00
8307	.06	3.00
8309	.03	11.00
8310	.08	4.00
8311	.04	1.00
8312	.11	22.00

• ROUTE = 1M KF COMMOD = 643 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.91	200.00

• ROUTE = 1M KF COMMOD = 604 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.89	58.00

• ROUTE = 1M KF COMMOD = 763 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.88	97.00

• ROUTE = 1M KF COMMOD = 340 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.38	140.00
8310	.50	246.00

• ROUTE = 1M KF COMMOD = 753 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.24	46.00
8304	.03	3.00
8305	.38	60.00
8308	.19	58.00

• ROUTE = 1M KF COMMOD = 581 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.08	8.00
8302	.05	5.00
8303	.27	31.00
8306	.10	5.00
8307	.04	11.00
8309	.16	8.00
8310	.14	9.00

• ROUTE = 1M KF COMMOD = 757 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.77	138.00

• ROUTE = 1M KF COMMOD = 742 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.23	6.00
8303	.18	8.00
8304	.18	10.00
8306	.15	10.00

• ROUTE = 1M KF COMMOD = 729 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.15	54.00
8304	.55	80.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 6 of 8 pages)

• ROUTE = 1M KF COMMOD = 705 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.23	30.00
8302	.02	4.00
8303	.02	7.00
8304	.05	10.00
8305	.01	2.00
8312	.16	11.00

• ROUTE = 1M KF COMMOD = 532 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.03	2.00
8305	.41	115.00
8306	.04	12.00

• ROUTE = 1M KF COMMOD = 764 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.41	42.00
8305	.06	2.00

• ROUTE = 1M KF COMMOD = 631 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.16	25.00
8306	.12	8.00
8310	.17	11.00

• ROUTE = 1M KF COMMOD = 65A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.43	44.00

• ROUTE = 1M KF COMMOD = 515 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.33	40.00

• ROUTE = 1M KF COMMOD = 591 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.11	5.00
8302	.14	12.00

• ROUTE = 1M KF COMMOD = 594 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.21	14.00

• ROUTE = 1M KF COMMOD = 656 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.20	43.00

• ROUTE = 1M KF COMMOD = 450 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	2.00
8302	.00	1.00
8305	.17	6.00
8312	.01	1.00

• ROUTE = 1M KF COMMOD = 721 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.15	20.00

• ROUTE = 1M KF COMMOD = 571 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.10	2.00
8303	.05	4.00

• ROUTE = 1M KF COMMOD = 573 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.07	9.00
8303	.00	1.00
8305	.00	1.00
8307	.01	1.00
8311	.02	2.00
8312	.03	1.00

• ROUTE = 1M KF COMMOD = 491 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.00	1.00
8304	.04	12.00
8305	.00	2.00
8306	.00	1.00
8309	.00	1.00
8310	.01	3.00
8311	.05	9.00

• ROUTE = 1M KF COMMOD = 531 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.10	4.00

• ROUTE = 1M KF COMMOD = 758 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.38	22.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 7 of 8 pages)

• ROUTE = 1M KF COMMOD = 590 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.07	10.00

• ROUTE = 1M KF COMMOD = 723 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.07	18.00

• ROUTE = 1M KF COMMOD = 650 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.07	27.00

• ROUTE = 1M KF COMMOD = 732 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.04	5.00
8308	.02	1.00

• ROUTE = 1M KF COMMOD = 596 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.05	11.00

• ROUTE = 1M KF COMMOD = 744 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.04	5.00

• ROUTE = 1M KF COMMOD = 706 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.03	3.00
8305	.00	1.00
8311	.01	1.00

• ROUTE = 1M KF COMMOD = 761 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.33	18.00

• ROUTE = 1M KF COMMOD = 759 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.03	6.00

• ROUTE = 1M KF COMMOD = 623 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.03	7.00
8304	.00	1.00

• ROUTE = 1M KF COMMOD = 766 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.02	2.00

• ROUTE = 1M KF COMMOD = 585 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.02	4.00

• ROUTE = 1M KF COMMOD = 608 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

Figure F-4. Norfolk to Italy Cargo Distribution List
(page 8 of 8 pages)

F-6. NORFOLK TO BAHRAIN

a. The following water port identifier (1M1 to PK1) was used to develop a surface route to parallel the air route Norfolk-Bahrain. The ports used to evaluate this route were Norfolk to Bahrain.

b. Surface port-packed cargoes that are air eligible were not available for diversion on this route; however, the Army's FY 84 quota of unsubscribed airlift capacity for this route was only 4 STON.

F-7. CHARLESTON TO CANAL ZONE

a. The following water port identifier (1P2 to BA1) was used to develop a surface route to parallel the air route Charleston-Howard. The ports of Charleston, SC to Balboa, Panama were used to evaluate the route.

b. TP-1 or TP-2 cargo were not available for diversion on this route. The total weight of TP-3 cargo shipped on this route was 1,461.7 STON and 100 percent of this cargo was POV (Figure F-5). POVs are not divertible, and the parallel air route has an FY 84 unsubscribed airlift capacity of 250 STON which cannot be filled.

TP3

• ROUTE = 1P BA COMMOD = 320 SHP MTHS = 14

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	2.29	666.00
8213	39.72	11693.00
8301	152.93	42337.00
8302	52.93	14256.00
8303	102.24	29016.00
8304	121.37	33645.00
8305	92.19	25774.00
8306	132.03	37686.00
8307	56.22	15751.00
8308	118.65	33966.00
8309	110.33	32072.00
8310	89.50	25823.00
8311	46.65	13621.00
8312	84.92	24165.00

• ROUTE = 1P BA COMMOD = 350 SHP MTHS = 13

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	16.50	4467.00
8301	40.27	11872.00
8302	9.88	2732.00
8303	14.88	4177.00
8304	16.14	4626.00
8305	19.78	5475.00
8306	35.46	9634.00
8307	12.03	3547.00
8308	18.76	5404.00
8309	22.82	6561.00
8310	28.46	8340.00
8311	10.38	2970.00
8312	8.43	2577.00

• ROUTE = 1P BA COMMOD = 340 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.27	175.00
8301	.92	363.00
8302	.16	76.00
8303	1.77	740.00
8304	.62	225.00
8307	.24	60.00
8308	.50	190.00
8309	.98	220.00
8311	.50	243.00

Figure F-5. Charleston to Canal Zone Cargo Distribution List

F-8. OAKLAND TO HAWAII AND GUAM

a. The following water port identifiers were used to develop a surface route to parallel the air route Travis-Hickam/Guam:

(3D2 to SA3)	(3D2 to XE1)	(3DC to XE3)
(3D2 to XE2)	(3D2 to SA1)	(3DS to SA3)

The ports used to analyze this route were Oakland to Pearl Harbor and Honolulu, Hawaii; Oakland to Naval Support Depot, Guam.

(1) The total amount of TP-1 cargo shipped on this route was 2.55 STON, all of it destined for Hawaii; 51 percent of the TP-1 cargo was chemicals. All of the TP-1 cargo was eligible for diversion.

(2) The total amount of TP-2 cargo shipped on this route was 64.25 STON, again destined only for Hawaii; 25 percent of the cargo was medicine and drugs, 17 percent was chemicals and household appliances, respectively, and the remaining commodities were POL products, liquor, and general cargoes. All of the commodities are air eligible except for the household appliances. The total amount of TP-1 and TP-2 cargo would fill 53.4 percent of the Army's quota of unsubscribed airlift for FY 84 for this route.

(3) The total amount of TP-3 cargo shipped on this route was 696.52 STON (690.94 STON to Hawaii and 5.58 STON to Guam). Forty-eight percent of the total weight was subsistence and general cargo (NOS). Drugs, ammunition, and household appliances each accounted for 8 percent of the total amount.

(4) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	3	0
TP-2	0	64	0
TP-3	2	694	0
Total	2	761	0
Total - 763 STON/2,124 MTON			
Route allocation - 90 STON			

The remaining TP-3 commodities were glass, chemicals, and printed forms (Figure F-6). Since the FY 84 Army quota for unsubscribed airlift capacity is 90 STON and TP-1 and TP-2 cargo accounted for 66 STON, the remaining 24 STON will be selected from the TP-3 cargo.

b. The prioritization process was performed by developing attribute weight factors for the attributes on the route, listing the alternatives and identifying the attribute values for each alternative. Table F-3 depicts the TP-3 cargo alternatives eligible for diversion. The attribute weight factors are then applied to the attribute values of the alternatives to derive the rank order of the alternatives. The TOPSIS software was used to mathematically compute the rank coefficients. Table F-4 illustrates the results of the TOPSIS analysis.

c. A negative cost avoidance existed for this route, since the surface transportation cost was less than the airlift transportation cost.

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ \text{(MTON)} \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 297 \times (92.70 - 95.20)$$

$$= (743)$$

Table F-3. Cargo Alternative Data, Oakland to Hawaii

Commodity	Monthly (STON)	Amount (MTON)	Density lb/cu ft	Effect on transition to war	Operational readiness	Ease of diversion	Morale effect
Subsistence[a]	32	53.6	29.9	4	6	3	9
Drugs[b]	3	9.3	15.6	2	8	4	8
Vehicle parts	.08	1.1	3.6	1	9	6	5
POL	1.0	1.3	40.0	2	8	7	5
Chemical products[c]	.33	1.0	16.0	5	7	3	5
Instruments	1.5	7.5	10.1	4	7	5	5
Construction materiel	.6	.4	70.0	6	7	2	7
Ammunition	4.6	4.2	56.0	1	9	8	6
HHG	.2	.7	12.5	9	1	1	9
General cargo (NOS)	5.5	16.6	16.9	2	7	2	5
Books	.33	.5	33.3	9	1	2	9
Glass products (NOS)	1.0	3.0	15.7	9	1	2	4
Stationery	.08	.2	25.0	9	1	2	7
Printed forms	1.3	2.5	25.0	7.	5	7	[illegible]
Paper products (NOS)	.25	.6	20.0	8	2	3	5
Plastic products (NOS)	.2	2.3	3.6	9	1	2	4

[a]Subsistence = commodity codes 500, 506, 51A, 51G, 512, 513, 518, 523, 524, 525, and 529.

[b]Drugs = commodity codes 530, 532, and 534.

[c]Chemical products = commodity codes 634 and 635.

Table F-4. Alternative Rank Order, Oakland to Hawaii

1	Subsistence	9	Chemical products
2	Ammunition	10	Printed forms
3	Vehicle parts	11	Books
4	Drugs	12	HHG
5	General cargo (NOS)	13	Glass
6	POL	14	Stationery
7	Construction materiel	15	Plastic products (NOS)
8	Instruments	16	Paper products (NOS)

• ROUTE = 3D XE COMMOD = 635 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.84	51.00
8307	.29	19.00
8309	.16	7.00

• ROUTE = 3D XE COMMOD = 534 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.65	61.00

• ROUTE = 3D XE COMMOD = 712 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.59	280.00

• ROUTE = 3D XE COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.02	1.00

• ROUTE = 3D XE COMMOD = 724 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 3D XE COMMOD = 576 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.00	1.00

TP2

• ROUTE = 3D XE COMMOD = 532 SHP MTHS = 13

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.00	1.00
8301	1.00	141.00
8302	1.52	222.00
8303	.24	56.00
8304	2.12	216.00
8305	.80	153.00
8306	.21	27.00
8307	.63	55.00
8308	4.14	483.00
8309	.00	1.00
8310	.63	183.00
8311	.03	2.00
8312	.05	4.00

• ROUTE = 3D XE COMMOD = 752 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	7.87	2475.00

• ROUTE = 3D XE COMMOD = 516 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.49	85.00
8311	5.89	335.00

• ROUTE = 3D XE COMMOD = 51A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	6.49	774.00

• ROUTE = 3D XE COMMOD = 603 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	5.56	264.00

• ROUTE = 3D XE COMMOD = 534 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.02	15.00
8301	1.26	215.00
8302	.39	94.00
8303	.33	67.00
8304	.55	87.00
8305	.83	186.00
8306	.40	154.00
8307	.11	29.00
8311	.01	1.00

• ROUTE = 3D XE COMMOD = 590 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.47	148.00
8305	1.95	207.00

• ROUTE = 3D XE COMMOD = 635 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.01	2.00
8301	.02	2.00
8302	3.32	155.00
8303	.01	1.00
8305	.01	3.00
8306	.01	2.00
8310	.00	1.00

• ROUTE = 3D XE COMMOD = 737 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	1.82	164.00
8310	.71	47.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 1 of 9 pages)

• ROUTE = 3D XE COMMOD = 758 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	2.37	904.00

• ROUTE = 3D XE COMMOD = 700 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.19	86.00
8306	1.69	544.00

• ROUTE = 3D XE COMMOD = 634 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.16	9.00
8308	.01	1.00
8309	.00	1.00
8310	1.50	437.00
8311	.06	5.00

• ROUTE = 3D XE COMMOD = 530 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.60	62.00
8305	.47	34.00
8310	.09	5.00
8311	.28	22.00
8312	.08	4.00

• ROUTE = 3D XE COMMOD = 712 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.95	360.00
8310	.34	120.00

• ROUTE = 3D XE COMMOD = 704 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.33	48.00
8311	.48	93.00
8312	.07	10.00

• ROUTE = 3D XE COMMOD = 658 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.05	7.00
8308	.77	62.00

• ROUTE = 3D XE COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.44	31.00

• ROUTE = 3D XE COMMOD = 651 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.04	20.00
8304	.04	19.00
8310	.19	61.00

• ROUTE = 3D XE COMMOD = 609 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.24	11.00

• ROUTE = 3D XE COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.29	40.00

• ROUTE = 3D XE COMMOD = 710 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.38	13.00

• ROUTE = 3D XE COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.08	18.00

• ROUTE = 3D XE COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.06	6.00

• ROUTE = 3D XE COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.06	12.00

• ROUTE = 3D XE COMMOD = 653 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.05	10.00

• ROUTE = 3D XE COMMOD = 656 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.02	5.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 2 of 9 pages)

• ROUTE = 3D XE COMMOD = 703 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.02	5.00

• ROUTE = 3D XE COMMOD = 657 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.01	4.00

• ROUTE = 3D XE COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.01	1.00

• ROUTE = 3D XE COMMOD = 706 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.00	1.00

• ROUTE = 3D XE COMMOD = 531 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

7R3

• ROUTE = 3D TA COMMOD = 725 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.05	14.00

• ROUTE = 3D XE COMMOD = 518 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	15.69	915.00
8302	4.51	311.00
8303	27.11	1812.00
8304	17.67	1291.00
8305	26.08	1450.00
8306	21.07	1185.00
8307	41.60	2419.00
8308	5.17	332.00
8309	22.98	1341.00
8310	41.68	2567.00
8311	31.47	1913.00
8312	8.51	480.00

• ROUTE = 3D XE COMMOD = 700 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.02	2.00
8302	8.93	2453.00
8303	14.57	1786.00
8304	1.13	143.00
8305	.91	78.00
8306	1.02	153.00
8307	.58	140.00
8308	5.66	444.00
8309	4.24	486.00
8310	19.29	1945.00
8311	4.83	534.00
8312	4.18	340.00

• ROUTE = 3D XE COMMOD = 680 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	8.31	317.00
8303	.01	1.00
8305	37.60	1335.00
8309	3.24	185.00
8310	7.47	246.00

• ROUTE = 3D XE COMMOD = 51A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	42.00	4947.00

• ROUTE = 3D XE COMMOD = 513 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.06	3.00
8304	.15	8.00
8305	12.12	681.00
8307	12.67	713.00
8308	2.31	267.00
8310	7.04	439.00
8311	.17	18.00
8312	.06	3.00

• ROUTE = 3D XE COMMOD = 752 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	2.59	1150.00
8307	24.72	7144.00

• ROUTE = 3D XE COMMOD = 524 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.65	132.00
8302	2.03	119.00
8304	14.20	775.00
8307	.15	8.00
8306	.32	23.00
8309	.32	29.00
8310	3.66	185.00
8311	4.85	279.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 3 of 9 pages)

• ROUTE = 3D XE COMMOD = 532 SHP MTHS = 13

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.04	10.00
8301	2.67	179.00
8302	.72	73.00
8303	2.41	232.00
8304	.60	65.00
8305	.26	45.00
8306	.05	8.00
8307	3.56	230.00
8308	2.10	159.00
8309	.26	33.00
8310	.84	238.00
8311	1.52	202.00
8312	.15	17.00

• ROUTE = 3D XE COMMOD = 737 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	1.08	100.00
8308	3.93	911.00
8309	4.60	325.00
8311	1.95	156.00
8312	3.17	220.00

• ROUTE = 3D XE COMMOD = 725 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	1.91	818.00
8302	5.26	1646.00
8303	3.50	1096.00
8312	2.80	1398.00

• ROUTE = 3D XE COMMOD = 603 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	12.12	594.00
8309	.35	18.00

• ROUTE = 3D XE COMMOD = 704 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	2.30	413.00
8305	.84	136.00
8306	1.36	85.00
8307	6.10	550.00
8309	1.24	163.00
8311	.40	54.00

• ROUTE = 3D XE COMMOD = 534 SHP MTHS = 13

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.04	13.00
8301	.65	108.00
8302	.39	67.00
8303	.71	133.00
8304	.44	125.00
8305	1.22	225.00
8306	.03	7.00
8307	.78	67.00
8308	1.13	295.00
8309	.65	68.00
8310	2.07	322.00
8311	1.61	310.00
8312	2.36	472.00

• ROUTE = 3D XE COMMOD = 658 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.16	96.00
8302	.68	58.00
8304	2.00	163.00
8305	.88	74.00
8306	1.57	120.00
8307	2.89	375.00
8308	.77	62.00
8311	1.53	122.00

• ROUTE = 3D XE COMMOD = 530 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.12	9.00
8301	.93	96.00
8303	1.10	116.00
8305	.44	41.00
8306	.76	66.00
8307	.70	60.00
8309	1.52	124.00
8311	1.83	179.00
8312	.46	43.00

• ROUTE = 3D XE COMMOD = 660 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	7.05	200.00

• ROUTE = 3D XE COMMOD = 712 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.48	52.00
8305	.43	39.00
8306	1.02	299.00
8307	2.32	1364.00
8308	2.51	717.00
8312	.17	46.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 4 of 9 pages)

• ROUTE = 3D XE COMMOD = 529 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.25	12.00
8302	.58	82.00
8303	.06	3.00
8304	.30	19.00
8305	.26	19.00
8307	.06	3.00
8308	4.47	233.00

• ROUTE = 3D XE COMMOD = 659 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.10	14.00
8308	4.18	1312.00
8310	.21	42.00

• ROUTE = 3D XE COMMOD = 635 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.11	7.00
8301	.59	76.00
8302	.64	72.00
8303	.04	7.00
8304	.19	21.00
8305	.51	62.00
8306	.94	91.00
8307	.02	2.00
8310	.28	27.00
8311	.42	41.00
8312	.48	57.00

• ROUTE = 3D XE COMMOD = 701 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	1.97	95.00
8305	.87	63.00
8308	.62	50.00
8310	.55	42.00

• ROUTE = 3D XE COMMOD = 721 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.46	46.00
8310	3.01	254.00
8311	.08	21.00

• ROUTE = 3D XE COMMOD = 525 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.01	56.00
8303	.84	40.00
8304	1.62	90.00

• ROUTE = 3D XE COMMOD = 340 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.83	348.00
8303	.42	163.00
8305	.47	195.00
8306	.72	235.00
8308	.49	213.00
8310	.43	195.00

• ROUTE = 3D XE COMMOD = 512 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	3.16	312.00

• ROUTE = 3D XE COMMOD = 506 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.80	64.00
8307	1.97	198.00

• ROUTE = 3D XE COMMOD = 651 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.35	25.00
8303	.16	64.00
8304	.07	15.00
8305	.74	264.00
8306	.16	40.00
8307	.02	7.00
8309	.85	364.00
8310	.27	70.00
8311	.39	112.00
8312	.04	14.00

• ROUTE = 3D XE COMMOD = 772 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.01	4.00
8302	.56	192.00
8303	.24	75.00
8305	.45	150.00
8307	.47	165.00
8308	.63	196.00
8310	.15	60.00
8311	.18	100.00

• ROUTE = 3D XE COMMOD = 500 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.51	50.00
8310	1.77	118.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List (page 5 of 9 pages)

• ROUTE = 3D XE COMMOD = 390 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	1.63	330.00

• ROUTE = 3D XE COMMOD = 523 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.62	55.00
8305	.66	33.00
8307	.18	41.00

• ROUTE = 3D XE COMMOD = 581 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.45	557.00

• ROUTE = 3D XE COMMOD = 730 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.18	82.00

• ROUTE = 3D XE COMMOD = 51G SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.36	20.00
8305	.77	44.00

• ROUTE = 3D XE COMMOD = 634 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.01	1.00
8308	.84	87.00
8309	.03	4.00
8310	.07	12.00
8312	.36	10.00

• ROUTE = 3D XE COMMOD = 582 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.03	2.00
8304	.46	49.00
8306	.28	25.00
8307	.13	5.00

• ROUTE = 3D XE COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.50	56.00
8308	.07	20.00

• ROUTE = 3D XE COMMOD = 65A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.52	170.00

• ROUTE = 3D XE COMMOD = 320 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.34	139.00

• ROUTE = 3D XE COMMOD = 591 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.16	23.00
8307	.12	19.00
8311	.06	4.00

• ROUTE = 3D XE COMMOD = 741 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.33	60.00

• ROUTE = 3D XE COMMOD = 531 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	1.00
8303	.30	1.00
8304	.05	26.00
8305	.19	47.00
8307	.00	1.00
8308	.05	8.00
8309	.01	2.00
8312	.01	2.00

• ROUTE = 3D XE COMMOD = 653 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.06	6.00
8305	.23	57.00
8312	.01	3.00

• ROUTE = 3D XE COMMOD = 527 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.24	22.00

• ROUTE = 3D XE COMMOD = 744 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.04	3.00
8308	.19	43.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 6 of 9 pages)

* ROUTE = 3D XE COMMOD = 453 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	1.00
8304	.02	2.00
8306	.02	4.00
8309	.09	10.00
8310	.02	4.00
8311	.02	4.00
8312	.02	5.00

* ROUTE = 3D XE COMMOD = 710 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.19	17.00

* ROUTE = 3D XE COMMOD = 620 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.18	14.00

* ROUTE = 3D XE COMMOD = 713 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.02	6.00
8311	.15	15.00

* ROUTE = 3D XE COMMOD = 753 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.14	5.00

* ROUTE = 3D XE COMMOD = 632 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.14	56.00

* ROUTE = 3D XE COMMOD = 756 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.05	7.00
8305	.00	2.00
8311	.08	21.00

* ROUTE = 3D XE COMMOD = 702 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.12	57.00

* ROUTE = 3D XE COMMOD = 511 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.11	15.00

* ROUTE = 3D XE COMMOD = 757 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.08	10.00

* ROUTE = 3D XE COMMOD = 574 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.07	3.00

* ROUTE = 3D XE COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.07	7.00

* ROUTE = 3D XE COMMOD = 686 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.05	4.00

* ROUTE = 3D XE COMMOD = 684 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.05	5.00

* ROUTE = 3D XE COMMOD = 608 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.02	2.00
8309	.02	2.00

* ROUTE = 3D XE COMMOD = 533 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.03	2.00

* ROUTE = 3D XE COMMOD = 706 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.31	3.00
8306	.01	2.00

* ROUTE = 3D XE COMMOD = 594 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.02	4.00

* ROUTE = 3D XE COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.02	3.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 7 of 9 pages)

• ROUTE = 3D XE COMMOD = 400 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.02	6.00
8312	.00	1.00

• ROUTE = 3D XE COMMOD = 705 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	2.00
8302	.00	1.00
8303	.01	2.00
8306	.00	1.00

• ROUTE = 3D XE COMMOD = 700 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.00	1.00
8305	.01	1.00
8306	.00	1.00

• ROUTE = 3D XE COMMOD = 631 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.00	1.00
8310	.01	1.00

• ROUTE = 3D XE COMMOD = 604 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.00	1.00

• ROUTE = 3D XE COMMOD = 761 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 3D XE COMMOD = 621 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.00	1.00
8306	.00	1.00
8307	.00	1.00

• ROUTE = 3D XE COMMOD = 543 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 3D XE COMMOD = 682 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 3D XE COMMOD = 579 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

• ROUTE = 3D XE COMMOD = 592 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.00	1.00

• ROUTE = 3D TA COMMOD = 712 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.27	22.00
8308	1.05	200.00
8312	.08	40.00

• ROUTE = 3D TA COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	1.21	217.00

• ROUTE = 3D TA COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.62	60.00
8307	.54	127.00

• ROUTE = 3D TA COMMOD = 702 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.25	44.00
8306	.05	9.00
8307	.37	66.00
8308	.29	49.00
8310	.19	43.00

• ROUTE = 3D TA COMMOD = 700 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	.34	48.00
8302	.08	24.00
8306	.04	5.00
8307	.03	8.00
8309	.02	12.00
8310	.04	6.00

• ROUTE = 3D TA COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.46	68.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List
(page 8 of 9 pages)

• ROUTE = 3D TA COMMOD = 741 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.09	47.00
8304	.03	9.00
8307	.06	22.00
8310	.10	18.00

• ROUTE = 3D TA COMMOD = 591 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.11	11.00
8305	.04	5.00
8306	.06	10.00
8310	.05	4.00

• ROUTE = 3D TA COMMOD = 590 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.21	50.00

• ROUTE = 3D TA COMMOD = 709 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.03	13.00
8307	.09	21.00
8310	.06	38.00

• ROUTE = 3D TA COMMOD = 763 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.17	17.00

• ROUTE = 3D TA COMMOD = 620 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	1.00
8302	.03	2.00
8304	.04	4.00

• ROUTE = 3D TA COMMOD = 534 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.05	5.00

• ROUTE = 3D TA COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.05	7.00

• ROUTE = 3D TA COMMOD = 740 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.04	8.00

• ROUTE = 3D TA COMMOD = 753 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	2.00

• ROUTE = 3D TA COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	3.00

• ROUTE = 3D TA COMMOD = 730 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.00	1.00

• ROUTE = 3D SA COMMOD = 720 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	2.55	668.00
8306	1.32	362.00

• ROUTE = 3D SA COMMOD = 621 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.62	102.00

• ROUTE = 3D SA COMMOD = 757 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.09	7.00

• ROUTE = 3D SA COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	6.00

Figure F-6. Oakland-Hawaii/Guam Cargo Distribution List (page 9 of 9 pages)

F-9. OAKLAND TO PHILIPPINE ISLANDS, DIEGO GARCIA

a. The following water port identifiers were used to develop a surface route to parallel the air route Travis-Clark/Diego Garcia: 3D2 to QF1, 3D1 to TA1, 3D1 to TA2. The ports analyzed to evaluate this route were Oakland to Manila, Philippines, and Oakland to Diego Garcia.

b. Only 7.7 STON of air-eligible, port-packed cargo was eligible for diversion on this route. The entire amount was transported to the Philippine Islands. The Army's FY 84 quota of unsubscribed airlift capacity of 75 STON could not be filled with port-packed cargo.

c. Cost avoidance for this route is:

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ \text{(MTON)} \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 33 \times (101.85 - 98.00)$$

$$= 127$$

F-10. OAKLAND TO OKINAWA

a. The following water port identifiers were used to develop a surface route to parallel the air route Travis-Kadena:

(3D1 to UBF)	(3D1 to UBF)	(3D2 to UB1)
(3D1 to UB1)	(3DS to UB1)	

The ports analyzed to evaluate this route were Oakland to Naha, Okinawa.

(1) TP-1 cargo was not shipped on this route. The total amount of TP-2 cargo shipped was 3.22 STON. Fifty percent of the cargo was electrical instruments, 30 percent was general cargo (NOS), and the remaining amount was housewares. All commodities were air-eligible except for housewares. Three percent of the Army's FY 84 quota of unsubscribed airlift capacity for this route could be filled by diverting TP-2 cargo.

(2) The total amount of TP-3 cargo shipped was 79.3 STON. Forty-seven percent of the cargo was electrical cables and 29 percent was HHG. The remaining amount primarily consisted of vehicles (POV and military vehicles). The POV are not eligible for diversion to airlift; therefore, about 57 percent of the FY 84 quota of unsubscribed airlift capacity for this route could be filled by diverting TP-3 cargo.

(3) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	0	0
TP-2	0	4	0
TP-3	24	37	6
Total	24	41	6

Total - 71 STON/498 MTON
Route allocation - 105 STON

b. The sum of TP-2 and TP-3 cargo would fill 60 percent of the FY 84 Army quota of unsubscribed airlift capacity for this route (Figure F-7). The total amount of cargo eligible for diversion on this route was 70.5 STON, leaving 34.5 STON of capacity unfilled.

c. Cost avoidance for the route is as follows:

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ (\text{MTON}) \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 498 \times (118.10 - 114.40)$$

$$+ \text{ HHG cost avoidance (airlift) } 3{,}603$$

$$= 5{,}446$$

TP 2

• ROUTE = 3D UB COMMOD = 658 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	1.39	432.00
8304	.37	9.00
8312	.15	20.00

• ROUTE = 3D UB COMMOD = 700 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.65	40.00
8307	.30	56.00

• ROUTE = 3D UB COMMOD = 753 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.61	129.00

• ROUTE = 3D UB COMMOD = 659 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.06	10.00

• ROUTE = 3D UB COMMOD = 65A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.00	1.00

TP3

• ROUTE = 3D UB COMMOD = 743 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.15	28.00
8308	20.34	1619.00

• ROUTE = 3D UB COMMOD = 745 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	16.43	1408.00

• ROUTE = 3D UB COMMOD = 395 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	2.20	605.00
8301	2.48	738.00
8303	3.80	1196.00
8304	.54	96.00
8306	2.80	658.00
8307	.54	142.00
8312	2.15	757.00

• ROUTE = 3D UB COMMOD = 320 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.72	610.00
8305	1.00	300.00
8306	2.92	968.00
8308	1.11	331.00
8310	1.34	295.00
8312	1.20	402.00

• ROUTE = 3D UB COMMOD = 390 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.68	403.00
8306	1.80	610.00
8307	2.12	615.00
8310	.62	196.00
8311	.67	195.00
8312	.20	58.00

• ROUTE = 3D UB COMMOD = 712 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	6.77	1881.00

• ROUTE = 3D UB COMMOD = 867 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	6.46	2226.00

• ROUTE = 3D UB COMMOD = 557 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.40	152.00
8307	.53	56.00

• ROUTE = 3D UB COMMOD = 723 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	2.41	159.00

• ROUTE = 3D UB COMMOD = 581 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.84	146.00

• ROUTE = 3D UB COMMOD = 700 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8206	.00	1.00
8304	.18	13.00
8311	.34	57.00

Figure F-7. Oakland to Okinawa Cargo Distribution List
(page 1 of 2 pages)

• ROUTE = 3D UB COMMOD = 340 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.25	69.00

• ROUTE = 3D UB COMMOD = 70X SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
9310	.18	48.00

• ROUTE = 3D UB COMMOD = 65A SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8206	.03	12.00
8308	.08	18.00

• ROUTE = 3D UB COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.10	16.00

• ROUTE = 3D UB COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	1.00
8305	.07	2.00

• ROUTE = 3D UB COMMOD = 556 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.26	8.00

• ROUTE = 3D UB COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.02	3.00

• ROUTE = 3D UB COMMOD = 592 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	5.00

• ROUTE = 3D UB COMMOD = 705 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	4.00

• ROUTE = 3D UB COMMOD = 734 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.00	2.00

• ROUTE = 3D UB COMMOD = 706 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.00	1.00

• ROUTE = 3D UB COMMOD = 603 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

• ROUTE = 3D UB COMMOD = 635 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	2.00

Figure F-7. Oakland to Okinawa Cargo Distribution List
(page 2 of 2 pages)

F-11. OAKLAND TO JAPAN, KOREA

a. The following water port identifiers were used to develop a surface route to parallel the air route Travis-Yokota/Osan:

(3D2 to UD6)	(3D2 to UL1)	(3D2 to UDC)	(3DS to UL1)
(3DS to UC2)	(3DS to UM1)	(3D2 to UC2)	(3D1 to UDC)
(3DS to UDC)	(3DS to UD6)	(3D1 to UC2)	(3D2 to UM1)
(3DS to UL7)	(3DK to UD6)	(3DJ to UD6)	(3D2 to UME)
(3D1 to UME)			(3DS to UME)

The ports analyzed to evaluate this surface route were Oakland to Pusan, Korea and Oakland to Yokohama, Japan.

(1) The total amount of TP-1 cargo shipped on this route was 156.6 STON (124.2 to Korea and 32.4 to Japan). Thirty-two percent was general cargo (NOS), 23 percent was paper and paper products, 21 percent was electrical cables, and 10 percent was repair parts (Figure F-8). Thirty percent of the Army's FY 84 unsubscribed airlift capacity allocation for this route could be filled with TP-1 cargo.

(2) The total amount of TP-2 cargo shipped on this route was 159.5 STON (95.95 to Korea and 63.5 to Japan). Sixteen percent of the weight was HHG, 13 percent was barbed wire, 11 percent was household appliances, 9 percent weapons, and 7 percent was paper and paper products. The remaining commodities are listed on Figure F-8. All commodities are eligible for diversion to airlift, and the combined total of TP-1 and TP-2 cargoes would fill 62.4 percent of the Army's FY 84 quota of unsubscribed airlift capability for this route.

(3) The total amount of cargo shipped on this route was 4,240 STON (3,073.6 STON to Korea and 1,166.4 STON to Japan). Thirty-three percent of the total weight was liquor, 11 percent was general cargo, and 8 percent was furniture. The other significant commodities were POL products, chemicals and glass items (Figure F-8). Three hundred sixteen STON of the Army's FY 84 quota of unsubscribed airlift for this route could be filled with air-eligible TP-1 and TP-2 commodities. The remaining 184 STON needed to satisfy the Army's capacity allocation was selected from TP-3 cargo commodities. The TP-3 cargoes were prioritized using the TOPSIS Model. First, attribute weight factors for the cargo attributes were developed. Second, the available TP-3 cargo alternatives were listed with associated attribute values (Table F-5). Then the attribute weight factors were applied to the attribute values of the alternatives using the TOPSIS software to develop the rank order of the alternatives (Table F-6). The remaining 184 STON of unsubscribed capacity could be filled by diverting only subsistence cargoes. The other commodities were not considered because the Army's capacity allocation was satisfied.

(4) Summary of divertible cargo:

	HHG (STON)	General (STON)	Special (STON)
TP-1	0	157	0
TP-2	26	134	0
TP-3	0	4,238	2
Total	26	4,529	2

Total - 4,557 STON/8,071 MTON
Route allocation - 500 STON

Table F-5. Cargo Alternative Data - Oakland to Japan/Korea

Commodity	Monthly (STON)	Amount (MTON)	Density lb/cu ft	Effect on transition to war	Operational readiness	Ease of diversion	Morale effect
Metal products (K)[a]	4.0	8.1	24.1	3	7	4	5
Metal products (J)	.8	7.0	5.9	4	6	4	5
Subsistence (J)[b]	48.0	75.0	32.3	5	6	3	9
Subsistence (K)	71.0	100.0	35.3	6	7	3	9
Vehicle parts (K)	1.3	6.3	9.2	1	9	6	5
Machinery parts (K)	4.1	10.0	19.6	1	9	6	5
Lumber (K)	1.0	2.0	34.3	6	7	4	7
Lumber (J)	2.0	5.2	20.0	7	5	4	7
Chemical products (K)[c]	8.2	10.9	37.5	6	7	3	5
Chemical products (J)	1.8	2.3	38.2	5	6	3	5
POL (K)[d]	12.0	115.0	5.2	3	8	7	5
POL (J)	1.0	1.2	39.3	2	8	7	5
Ammunition (J)	7.0	35.7	9.9	1	9	8	6
Empty containers (J)	16.0	83.3	9.7	8	6	4	1
Construction material (K)	1.7	3.3	25.0	5	7	2	7
Instruments (K)	.5	3.0	8.6	4	7	5	5
Printed forms (K)	4.7	9.8	23.9	7	5	7	6
Paper products (NOS) (K)	1.8	6.0	14.6	8	2	3	5
General cargo (NOS) (K)	38.6	60.0	32.1	2	7	2	5
Gneral cargo (NOS) (J)	2.0	7.7	12.9	2	7	2	5
Stationery (K)	.1	.2	30.0	9	1	2	7
Glass products (K)	3.0	13.4	11.5	9	1	2	4
Books (K)	.6	.8	35.0	9	1	2	9
Books (J)	4.3	9.8	21.7	9	1	2	9
Hardware (NOS) (J)	.6	3.3	8.8	5	7	3	7
Plastic products (K)	.5	4.0	6.3	9	1	2	4
Cement (liquid & rubber) K)	.8	1.5	25.7	5	7	3	7
HHG (K)	10.8	72.9	7.4	9	1	1	9
HHG (J)	5.0	6.0	41.4	9	1	1	9
Military vehicles (J)	.8	6.0	5.7	2	8	9	6
Military vehicles (K)	.08	.5	8.6	1	9	9	7
Vehicles (NOS) (K)	.5	3.5	7.0	1	9	9	6

[a]Metal products = commodity codes 576 and 578.

[b]Subsistence = commodity codes 518 and 500.

[c]Machinery parts = commodity codes 594, 592, and 591.

[d]Chemical products = commodity codes 603 and 604.

Table F-6. Alternative Rank Order - Oakland to Japan/Korea

1	Subsistance (K)	17	Military vehicles (J)
2	Subsistence (J)	18	Printed forms (K)
3	General cargo (K)	19	Instruments (K)
4	Empty container (J)	20	Lumber (J)
5	Chemical products (K)	21	Metal products (K)
6	POL (K)	22	Chemical products (J)
7	Ammunition (J)	23	HHG (K)
8	Lumber (K)	24	General cargo (NOS) (J)
9	Machinery parts (K)	25	HHG (J)
10	Vehicle parts (K)	26	Books(J)
11	Military vehicles (J)	27	Stationery (K)
12	Vehicle (NOS) (K)	28	Books (K)
13	Construction materiel (K)	29	Stationery (J)
14	Cement (liquid & rubber)(K)	30	Glass products (K)
15	Hardware (K)	31	Plastic products (K)
16	POL (J)	32	Paper products (NOS) (K)

b. Cost avoidance for the route is as follows:

Travis to Yokoto:

$$\underset{(\$)}{\text{Cost avoidance}} = \underset{(\text{MTON})}{\text{Divertible cargo}} \times \left(\underset{(\$/\text{MTON})}{\text{Surface transportation}} - \underset{(\$/\text{MTON})}{\text{Airlift transportation}} \right)$$

$$= 367 \times (87.30 - 76.80)$$

+ HHG cost avoidance (airlift)
576

= 4,429

Travis to Osan:

$$\underset{(\$)}{\text{Cost avoidance}} = \underset{(\text{MTON})}{\text{Divertible cargo}} \times \left(\underset{(\$/\text{MTON})}{\text{Surface transportation}} - \underset{(\$/\text{MTON})}{\text{Airlift transportation}} \right)$$

$$= 996 \times (90.45 - 90.0)0$$

+ HHG cost avoidance (airlift)
6,750

= 7,196

Total cost avoidance: $11,625

TP1

* ROUTE = 3D UC COMMOD = 745 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	1.61	147.00
8312	14.99	959.00

* ROUTE = 3D UC COMMOD = 590 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	7.39	1323.00

* ROUTE = 3D UC COMMOD = 894 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	1.66	205.00

* ROUTE = 3D UC COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.48	44.00

* ROUTE = 3D UC COMMOD = 729 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.19	75.00

* ROUTE 3D UC COMMOD = 764 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.12	26.00

* ROUTE = 3D UC COMMOD = 436 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.12	45.00

* ROUTE = 3D UC COMMOD = 700 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	4.73	1323.00
8305	.22	68.00
8307	14.08	1247.00
8308	27.30	3763.00
8310	.39	39.00

* ROUTE = 3D UC COMMOD = 745 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.05	3.00
8308	10.27	2164.00
8311	6.51	411.00

* ROUTE = 3D UC COMMOD = 721 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.31	1.00
8310	11.42	856.00

* ROUTE = 3D UC COMMOD = 65A SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.05	10.00
8312	9.25	1804.00

* ROUTE = 3D UC COMMOD = 590 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	2.21	764.00

* ROUTE = 3D UC COMMOD = 220 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	1.53	55.00

* ROUTE = 3D UC COMMOD = 635 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8307	.93	121.00
8308	.14	21.00

* ROUTE = 3D UC COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.90	95.00

* ROUTE = 3D UC COMMOD = 736 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.33	34.00
8308	.39	24.00

* ROUTE = 3D UC COMMOD = 772 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.66	131.00

* ROUTE = 3D UC COMMOD = 576 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.32	21.00
8311	.21	80.00
8312	.45	36.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 1 of 21 pages)

• ROUTE = 3D UC COMMOD = 795 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.62	128.00

• ROUTE = 3D UC COMMOD = 584 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.30	80.00

• ROUTE = 3D UC COMMOD = 756 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.17	37.00

• ROUTE = 3D UC COMMOD = 759 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.04	5.00
8308	.08	8.00

• ROUTE = 3D UC COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.07	2.00

• ROUTE = 3D UC COMMOD = 734 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.04	5.00
8311	.02	3.00

• ROUTE = 3D UC COMMOD = 620 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.05	5.00

• ROUTE = 3D UC COMMOD = 581 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.03	2[illegible].00

• ROUTE = 3D UC COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.02	4.00

• ROUTE = 3D UC COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.01	2.00

• ROUTE = 3D UC COMMOD = 705 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.00	1.00

• ROUTE = 3D UL COMMOD = 592 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.04	2.00

• ROUTE = 3D UP COMMOD = 721 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	1.77	348.00
8307	3.57	523.00
8308	7.74	427.00
8310	10.62	1698.00
8312	.05	9.00

• ROUTE = 3D UP COMMOD = 712 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.39	228.00
8309	1.04	333.00
8310	2.33	893.00
8311	.15	35.00

• ROUTE = 3D UP COMMOD = 701 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	2.11	111.00

• ROUTE = 3D UP COMMOD = 700 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.78	52.00
8310	.21	61.00
8311	.04	13.00

• ROUTE = 3D UP COMMOD = 736 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.34	31.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 2 of 21 pages)

```
* ROUTE = 3D UP   COMMOD = 772   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8312            .34               130.00

* ROUTE = 3D UP   COMMOD = 513   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8310            .26                13.00

* ROUTE = 3D UP   COMMOD = 651   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8310            .21                47.00

* ROUTE = 3D UP   COMMOD = 557   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8309            .07                24.00

* ROUTE = 3D UP   COMMOD = 658   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8311            .02                 4.00
```

TP2

```
* ROUTE = 3D UC   COMMOD = 741   SHP MTHS = 3
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8301           1.04               109.00
8302            .86               141.00
8303           1.93               285.00

* ROUTE = 3D UC   COMMOD = 700   SHP MTHS = 4
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8301            .26                25.00
8307            .23                54.00
8306            .06                17.00
8310           1.08               172.00

* ROUTE = 3D UC   COMMOD = 703   SHP MTHS = 2
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8301            .21                34.00
8303            .45                54.00

* ROUTE = 3D UC   COMMOD = 753   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8301            .64                82.00

* ROUTE = 3D UC   COMMOD = 576   SHP MTHS = 2
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8302            .41                11.00
8308            .00                 1.00

* ROUTE = 3D UC   COMMOD = 757   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8302            .35                23.00

* ROUTE = 3D UC   COMMOD = 709   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8302            .25                39.00

* ROUTE = 3D UC   COMMOD = 763   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8303            .24                37.00

* ROUTE = 3D UC   COMMOD = 702   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8303            .24                41.00

* ROUTE = 3D UC   COMMOD = 756   SHP MTHS = 2
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8302            .17                17.00
8306            .01                 1.00

* ROUTE = 3D UC   COMMOD = 725   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8304            .16                29.00

* ROUTE = 3D UC   COMMOD = 745   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8301            .10                12.00

* ROUTE = 3D UC   COMMOD = 713   SHP MTHS = 1
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8307            .10                33.00

* ROUTE = 3D UC   COMMOD = 706   SHP MTHS = 2
YRMO      WEIGHT (TONS)     VOLUME (CU FT)
8302            .06                 7.00
8305            .01                 1.00
```

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 3 of 21 pages)

• ROUTE = 3D UC COMMOD = 712 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.06	24.00

• ROUTE = 3D UC COMMOD = 534 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.35	10.00
8311	.30	1.00

• ROUTE = 3D UC COMMOD = 582 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.05	16.00

• ROUTE = 3D UC COMMOD = 623 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.04	4.00

• ROUTE = 3D UC COMMOD = 658 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.34	6.00
8308	.00	1.00

• ROUTE = 3D UC COMMOD = 592 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	8.00

• ROUTE = 3D UC COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	1.00

• ROUTE = 3D UC COMMOD = 705 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.00	4.00

• ROUTE = 3D UC COMMOD = 653 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.00	1.00

• ROUTE = 3D UC COMMOD = 603 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	15.61	748.00

• ROUTE = 3D UC COMMOD = 721 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.16	11.00
8304	1.12	69.00
8306	7.71	610.00
8307	6.28	570.00

• ROUTE = 3D UC COMMOD = 395 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	3.30	728.00
8307	6.16	1680.00
8308	3.97	1133.00
8310	.18	40.00
8311	.92	420.00

• ROUTE = 3D UC COMMOD = 737 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	6.23	572.00

• ROUTE = 3D UC COMMOD = 712 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.40	412.00
8302	1.69	451.00
8305	.65	135.00

• ROUTE = 3D UC COMMOD = 700 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	2.05	151.00
8305	.18	20.00
8306	.65	226.00
8307	2.40	133.00
8308	.08	10.00
8309	.08	9.00
8310	.07	39.00

• ROUTE = 3D UC COMMOD = 65A SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.17	31.00
8306	1.80	348.00
8308	1.27	196.00
8309	.47	65.00
8311	.07	11.00
8312	.05	14.00

• ROUTE = 3D UC COMMOD = 592 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	2.38	147.00
8305	1.00	71.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 4 of 21 pages)

• ROUTE = 3D UC COMMOD = 658 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.03	6.00
8303	1.43	221.00
8304	1.31	265.00
8306	.06	6.00
8307	.03	6.00
8308	.31	85.00

• ROUTE = 3D UC COMMOD = 713 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.44	137.00
8304	1.67	22.00
8306	.11	16.00
8307	.03	5.00
8311	.04	2.00

• ROUTE = 3D UC COMMOD = 736 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.04	28.00
8304	1.37	57.00
8308	.04	3.00
8310	.55	46.00

• ROUTE = 3D UC COMMOD = 590 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	1.40	382.00
8310	.20	40.00

• ROUTE = 3D UC COMMOD = 581 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.06	198.00

• ROUTE = 3D UC COMMOD = 517 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	1.02	67.00

• ROUTE = 3D UC COMMOD = 701 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.69	68.00

• ROUTE = 3D UC COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.62	74.00

• ROUTE = 3D UC COMMOD = 576 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.54	114.00

• ROUTE = 3D UC COMMOD = 703 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.08	10.00
8306	.24	48.00
8307	.22	74.00

• ROUTE = 3D UC COMMOD = 741 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.05	6.00
8306	.48	92.00

• ROUTE = 3D UC COMMOD = 659 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.35	88.00
8309	.06	11.00
8311	.06	11.00

• ROUTE = 3D UC COMMOD = 582 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	1.00
8305	.27	24.00
8306	.16	6.00

• ROUTE = 3D UC COMMOD = 705 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.30	21.00
8311	.00	1.00

• ROUTE = 3D UC COMMOD = 653 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.28	23.00

• ROUTE = 3D UC COMMOD = 745 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.14	8.00
8302	.07	6.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 5 of 21 pages)

* ROUTE = 3D UC COMMOD = 534 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	2.00
8302	.06	17.00
8306	.01	3.00
8308	.01	10.00
8311	.05	24.00
8312	.02	3.00

* ROUTE = 3D UC COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.11	17.00

* ROUTE = 3D UC COMMOD = 772 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.03	3.00
8311	.08	8.00

* ROUTE = 3D UC COMMOD = 734 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.06	9.00
8312	.03	5.00

* ROUTE = 3D UC COMMOD = 635 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8302	.04	7.00
8304	.00	1.00
8305	.03	3.00

* ROUTE = 3D UC COMMOD = 761 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.06	16.00

* ROUTE = 3D UC COMMOD = 593 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.06	6.00

* ROUTE = 3D UC COMMOD = 657 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.04	4.00

* ROUTE = 3D UC COMMOD = 746 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.04	2.00

* ROUTE = 3D UC COMMOD = 732 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.02	3.00

* ROUTE = 3D UC COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	3.00

* ROUTE = 3D UC COMMOD = 532 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.01	4.00

* ROUTE = 3D UC COMMOD = 530 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

* ROUTE = 3D UC COMMOD = 620 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.00	1.00

* ROUTE = 3D UP COMMOD = 664 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	20.42	1522.00

* ROUTE = 3D UP COMMOD = 395 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	3.77	898.00
8306	.90	302.00
8307	2.69	615.00
8311	3.16	840.00

* ROUTE = 3D UP COMMOD = 725 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	4.58	1656.00
8301	3.88	1404.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 6 of 21 pages)

• ROUTE = 3D UP COMMOD = 721 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	5.00	280.00
8307	.15	16.00

• ROUTE = 3D UP COMMOD = 518 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.72	53.00
8312	2.69	165.00

• ROUTE = 3D UP COMMOD = 635 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.09	48.00

• ROUTE = 3D UP COMMOD = 743 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.93	104.00

• ROUTE = 3D UP COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.79	194.00

• ROUTE = 3D UP COMMOD = 532 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.68	86.00

• ROUTE = 3D UP COMMOD = 390 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.47	196.00

• ROUTE = 3D UP COMMOD = 712 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.44	46.00

• ROUTE = 3D UP COMMOD = 534 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.09	16.00
8308	.10	12.00

• ROUTE = 3D UP COMMOD = 586 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.09	7.00

• ROUTE = 3D UP COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	3.00

• ROUTE = 3D UP COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	.01	1.00

• ROUTE = 3D UL COMMOD = 576 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	4.80	652.00
8311	1.70	230.00

• ROUTE = 3D UL COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	3.11	230.00

• ROUTE = 3D UL COMMOD = 691 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.72	100.00

• ROUTE = 3D UL COMMOD = 686 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.37	16.00

• ROUTE = 3D UL COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.09	20.00

• ROUTE = 3D UL COMMOD = 593 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.07	4.00

TP3

• ROUTE = 3D UC COMMOD = 737 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	37.93	3332.00
8303	9.15	596.00
8304	2.09	153.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 7 of 21 pages)

* ROUTE = 3D UC COMMOD = 712 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	24.00
8302	.18	25.00
8303	3.27	288.00
8304	6.81	1736.00
8305	1.45	646.00
8308	20.39	1824.00

* ROUTE = 3D UC COMMOD = 635 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	15.08	621.00
8302	.43	59.00
8303	.18	27.00
8304	.11	12.00
8305	.08	10.00
8306	4.23	264.00
8307	.09	10.00
8308	.23	22.00

* ROUTE = 3D UC COMMOD = 621 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.82	122.00
8304	.06	8.00
8305	6.79	308.00
8306	.61	54.00
8307	10.01	403.00
8311	.35	21.00

* ROUTE = 3D UC COMMOD = 576 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.91	77.00
8302	11.02	624.00
8305	.11	9.00
8307	.01	4.00
8308	5.16	931.00

* ROUTE = 3D UC COMMOD = 581 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.15	67.00
8305	15.31	3200.00

* ROUTE = 3D UC COMMOD = 700 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.53	105.00
8302	3.11	1002.00
8303	.15	31.00
8304	.76	204.00
8306	.05	2.00
8307	.04	11.00
8308	8.66	1593.00
8311	.14	23.00

* ROUTE = 3D UC COMMOD = 772 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.19	42.00
8302	.16	57.00
8306	2.19	611.00
8307	.02	3.00
8308	4.12	1231.00
8309	.11	35.00

* ROUTE = 3D UC COMMOD = 518 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	6.67	328.00

* ROUTE = 3D UC COMMOD = 894 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	5.09	1466.00
8311	1.34	228.00

* ROUTE = 3D UC COMMOD = 705 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.33	53.00
8304	.02	6.00
8305	.21	19.00
8306	5.06	262.00
8307	.51	31.00
8311	.01	3.00

* ROUTE = 3D UC COMMOD = 725 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	5.48	1561.00

* ROUTE = 3D UC COMMOD = 721 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	4.90	340.00
8304	.05	6.00
8307	.05	8.00
8310	.05	8.00
8311	.04	9.00

* ROUTE = 3D UC COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	4.95	222.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 8 of 21 pages)

• ROUTE = 3D UC COMMOD = 706 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.33	43.00
8304	.01	2.00
8305	2.09	166.00
8306	.41	48.00
8307	.61	32.00
8311	.02	1.00

• ROUTE = 3D UC COMMOD = 704 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	3.02	430.00

• ROUTE = 3D UC COMMOD = 758 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.50	210.00
8310	.09	21.00

• ROUTE = 3D UC COMMOD = 730 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.49	101.00

• ROUTE = 3D UC COMMOD = 867 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	1.34	228.00

• ROUTE = 3D UC COMMOD = 741 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.52	69.00
8302	.57	78.00
8305	.12	12.00

• ROUTE = 3D UC COMMOD = 658 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.09	64.00
8303	.00	1.00
8304	.08	20.00
8307	.39	12.00
8308	.05	5.00

• ROUTE = 3D UC COMMOD = 591 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.52	103.00

• ROUTE = 3D UC COMMOD = 713 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.39	13.00
8306	.05	5.00
8308	.07	6.00

• ROUTE = 3D UC COMMOD = 671 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.03	8.00
8305	.38	115.00

• ROUTE = 3D UC COMMOD = 756 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.16	36.00
8312	.19	75.00

• ROUTE = 3D UC COMMOD = 620 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.21	20.00
8304	.04	6.00
8305	.01	3.00
8306	.06	12.00
8307	.02	3.00
8308	.01	1.00

• ROUTE = 3D UC COMMOD = 753 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.29	15.00
8308	.04	2.00

• ROUTE = 3D UC COMMOD = 582 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.05	2.00
8307	.27	68.00

• ROUTE = 3D UC COMMOD = 631 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.29	28.00

• ROUTE = 3D UC COMMOD = 757 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.12	10.00
8303	.03	2.00
8304	.13	14.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 9 of 21 pages)

• ROUTE = 3D UC COMMOD = 534 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.20	15.00
8304	.34	3.00
8305	.00	1.00
8310	.04	6.00

• ROUTE = 3D UC COMMOD = 450 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.27	21.00

• ROUTE = 3D UC COMMOD = 659 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.10	34.00
8307	.10	5.00

• ROUTE = 3D UC COMMOD = 761 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.19	75.00

• ROUTE = 3D UC COMMOD = 702 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.03	7.00
8303	.13	23.00

• ROUTE = 3D UC COMMOD = 592 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.06	10.00
8302	.10	14.00

• ROUTE = 3D UC COMMOD = 653 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	6.00
8302	.00	1.00
8311	.07	14.00

• ROUTE = 3D UC COMMOD = 732 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.07	7.00
8303	.03	1.00
8307	.00	1.00

• ROUTE = 3D UC COMMOD = 585 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.07	15.00

• ROUTE = 3D UC COMMOD = 752 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.07	9.00

• ROUTE = 3D UC COMMOD = 744 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.34	9.00
8302	.02	5.00

• ROUTE = 3D UC COMMOD = 743 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	2.00
8305	.04	6.00

• ROUTE = 3D UC COMMOD = 709 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.04	5.00

• ROUTE = 3D UC COMMOD = 532 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	5.00

• ROUTE = 3D UC COMMOD = 590 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00

• ROUTE = 3D UC COMMOD = 724 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	3.00

• ROUTE = 3D UC COMMOD = 652 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	.00	1.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 10 of 21 pages)

• ROUTE = 3D UC COMMOD = 491 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.00	1.00

• ROUTE = 3D UC COMMOD = 65A SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.00	1.00
8306	.00	1.00

• ROUTE = 3D UC COMMOD = 754 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.00	1.00

• ROUTE = 3D UC COMMOD = 604 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00

• ROUTE = 3D UC COMMOD = 518 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	65.08	3418.00
8301	65.65	3474.00
8302	98.66	5811.00
8303	26.57	1607.00
8304	81.59	4546.00
8305	73.56	4039.00
8306	40.28	2444.00
8308	93.36	4958.00
8309	94.09	5314.00
8310	20.15	1522.00
8311	63.59	3340.00
8312	126.31	7313.00

• ROUTE = 3D UC COMMOD = 320 SHP MTHS = 13

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	5.84	1627.00
8301	43.26	12342.00
8302	8.75	2590.00
8303	34.15	9621.00
8304	13.27	4014.00
8305	48.61	14185.00
8306	71.21	20563.00
8307	68.95	20205.00
8308	61.10	18346.00
8309	43.21	12673.00
8310	41.98	12565.00
8311	36.23	10145.00
8312	12.08	3509.00

• ROUTE = 3D UC COMMOD = 700 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	22.17	3727.00
8302	349.62	10155.00
8303	17.18	651.00
8304	12.62	1783.00
8305	10.36	1404.00
8306	3.23	243.00
8307	14.49	1429.00
8308	6.14	1798.00
8309	6.89	4176.00
8310	2.97	1073.00
8311	2.09	208.00
8312	.29	56.00

• ROUTE = 3D UC COMMOD = 712 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.20	192.00
8302	46.76	5185.00
8303	61.77	6760.00
8304	25.40	3854.00
8305	27.03	2337.00
8306	38.73	3698.00
8307	36.19	6646.00
8308	52.61	9243.00
8309	1.31	706.00
8310	.68	542.00
8311	.83	193.00
8312	12.04	2058.00

• ROUTE = 3D UC COMMOD = 395 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	18.83	5414.00
8302	5.42	1633.00
8303	.65	140.00
8304	5.98	1712.00
8305	11.47	2962.00
8306	30.92	8046.00
8307	21.89	5879.00
8308	19.79	5007.00
8309	1.72	410.00
8310	7.75	2215.00
8311	5.61	1723.00

• ROUTE = 3D UC COMMOD = 603 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	8.79	429.00
8303	4.63	220.00
8304	18.52	880.00
8306	23.26	1106.00
8307	15.61	748.00
8308	.51	40.00
8309	8.98	440.00
8310	3.70	176.00
8311	.18	8.00
8312	23.35	1144.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 11 of 21 pages)

• ROUTE = 3D UC COMMOD = 635 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	6.27	256.00
8302	13.05	606.00
8303	5.31	318.00
8304	2.86	220.00
8305	21.65	1035.00
8306	10.32	876.00
8307	.20	13.00
8308	13.68	725.00
8309	.01	2.00
8310	.30	23.00
8311	.03	3.00
8312	.90	71.00

• ROUTE = 3D UC COMMOD = 704 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	12.04	1378.00
8302	.59	76.00
8304	1.37	265.00
8305	1.37	352.00
8306	23.91	2933.00
8307	.10	28.00
8308	3.13	466.00
8310	.72	101.00
8311	.88	151.00
8312	.60	76.00

• ROUTE = 3D UC COMMOD = 350 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.38	564.00
8302	1.73	420.00
8303	6.37	1890.00
8304	1.26	367.00
8305	5.97	1987.00
8306	3.24	1067.00
8307	9.29	2690.00
8308	3.85	1402.00
8309	3.99	1575.00
8311	3.48	1162.00

• ROUTE = 3D UC COMMOD = 604 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	9.21	683.00
8307	.01	2.00
8308	15.34	694.00
8310	.01	1.00
8312	.00	1.00

• ROUTE = 3D UC COMMOD = 594 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.50	63.00
8302	10.54	710.00
8303	.03	7.00
8306	.02	3.00
8307	.06	10.00
8308	6.67	249.00
8311	5.59	618.00

• ROUTE = 3D UC COMMOD = 664 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	20.04	1496.00
8307	.65	86.00

• ROUTE = 3D UC COMMOD = 578 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	17.34	496.00

• ROUTE = 3D UC COMMOD = 592 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.24	100.00
8303	9.66	571.00
8304	.24	52.00
8306	.16	58.00
8307	1.39	150.00
8309	.04	30.00
8311	5.31	232.00
8312	.12	14.00

• ROUTE = 3D UC COMMOD = 753 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.89	615.00
8302	11.50	1266.00
8304	.12	17.00
8305	.07	5.00
8306	.32	41.00
8307	.26	24.00
8308	.39	49.00
8310	.23	32.00
8311	.36	73.00

• ROUTE = 3D UC COMMOD = 721 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.36	155.00
8302	.65	401.00
8304	.09	18.00
8306	.78	140.00
8307	1.40	466.00
8310	.49	87.00
8311	.01	3.00
8312	10.21	1276.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 12 of 21 pages)

* ROUTE = 3D UC COMMOD = 576 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.07	9.00
8303	.06	4.00
8304	1.55	245.00
8305	1.75	192.00
8306	4.97	268.00
8307	4.09	727.00
8308	.64	124.00
8310	1.30	276.00
8311	.03	4.00
8312	.16	9.00

* ROUTE = 3D UC COMMOD = 752 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	9.76	1949.00
8303	1.37	230.00
8305	1.86	422.00
8308	.22	24.00
8310	.03	10.00

* ROUTE = 3D UC COMMOD = 561 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	12.11	688.00

* ROUTE = 3D UC COMMOD = 352 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	1.60	501.00
8307	1.77	584.00
8309	1.25	473.00
8310	2.60	687.00
8312	4.83	1439.00

* ROUTE = 3D UC COMMOD = 729 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.14	14.00
8302	1.18	151.00
8304	7.11	1120.00
8306	1.02	82.00
8307	.26	97.00
8312	1.70	218.00

* ROUTE = 3D UC COMMOD = 591 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	27.00
8304	.66	193.00
8306	.61	120.00
8307	1.76	410.00
8308	1.14	244.00
8309	.64	183.00
8310	.98	253.00
8311	4.64	928.00

* ROUTE = 3D UC COMMOD = 700 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	8.85	798.00

* ROUTE = 3D UC COMMOD = 701 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.29	121.00
8310	.00	1.00
8312	5.43	340.00

* ROUTE = 3D UC COMMOD = 737 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.34	36.00
8308	.97	150.00
8309	3.24	244.00
8311	2.72	199.00

* ROUTE = 3D UC COMMOD = 658 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.11	9.00
8303	.31	31.00
8304	.04	24.00
8305	2.04	425.00
8306	.01	3.00
8307	.51	63.00
8308	4.10	836.00

* ROUTE = 3D UC COMMOD = 581 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.16	6.00
8302	.14	67.00
8304	6.79	2601.00

* ROUTE = 3D UC COMMOD = 609 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.24	13.00
8304	.29	15.00
8308	6.31	455.00

* ROUTE = 3D UC COMMOD = 725 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.26	120.00
8302	.32	58.00
8303	3.79	1074.00
8305	.44	205.00
8306	.04	9.00
8311	1.26	388.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 13 of 21 pages)

• ROUTE = 3D UC COMMOD = 621 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	4.55	212.00
8308	1.36	64.00

• ROJTE = 3D UC COMMOD = 593 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	5.69	550.00
8311	.00	1.00

• ROUTE = 3D UC COMMOD = 606 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	5.36	165.00

• ROUTE = 3D UC COMMOD = 722 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	5.28	1824.00

• ROUTE = 3D UC COMMOD = 710 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	5.27	238.00

• ROUTE = 3D UC COMMOD = 582 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	4.28	321.00
8304	.96	40.00

• ROUTE = 3D UC COMMOD = 686 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.33	23.00
8304	2.40	587.00
8305	.43	203.00
8307	.20	17.00
8311	1.43	81.00
8312	.08	5.00

• ROUTE = 3D UC COMMOD = 659 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.10	25.00
8307	.30	60.00
8308	.20	45.00
8309	.04	11.00
8310	.06	16.00
8311	2.13	381.00

• ROUTE = 3D UC COMMOD = 390 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.44	98.00
8302	.02	15.00
8303	.35	85.00
8305	.65	205.00
8307	.25	98.00
8310	.85	196.00

• ROUTE = 3D UC COMMOD = 534 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.15	60.00
8303	.07	20.00
8305	.73	112.00
8306	.02	4.00
8307	.03	6.00
8308	1.01	212.00
8309	.00	1.00
8310	.35	[illegible]
8312	.18	35.00

• ROUTE = 3D UC COMMOD = 713 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.30	50.00
8302	.68	84.00
8305	.05	24.00
8306	.33	27.00
8307	.40	45.00
8308	.02	2.00
8310	.54	10.00
8311	.16	29.00

• ROUTE = 3D UC COMMOD = 506 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.39	143.00

• ROUTE = 3D UC COMMOD = 634 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.20	18.00
8305	1.80	68.00
8307	.32	15.00
8312	.01	2.00

• ROUTE = 3D UC COMMOD = 740 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	2.31	252.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 14 of 21 pages)

• ROUTE = 3D UC COMMOD = 500 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.22	16.00
8307	.36	105.00
8308	.40	72.00
8310	1.30	204.00

• ROUTE = 3D UC COMMOD = 513 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	1.95	165.00
8308	.26	40.00

• ROUTE = 3D UC COMMOD = 741 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.26	36.00
8305	.18	18.00
8306	.67	95.00
8307	.27	28.00
8308	.45	46.00
8309	.04	9.00
8312	.24	24.00

• ROUTE = 3D UC COMMOD = 757 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.20	12.00
8307	.83	123.00
8308	.06	7.00
8309	.11	10.00
8311	.59	41.00

• ROUTE = 3D UC COMMOD = 527 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8312	1.76	80.00

• ROUTE = 3D UC COMMOD = 517 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.62	80.00

• ROUTE = 3D UC COMMOD = 705 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.20	18.00
8302	.03	6.00
8304	.02	3.00
8305	.10	9.00
8306	.88	51.00
8307	.11	10.00
8311	.01	3.00

• ROUTE = 3D UC COMMOD = 756 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	1.09	204.00

• ROUTE = 3D UC COMMOD = 894 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	1.08	172.00

• ROUTE = 3D UC COMMOD = 718 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.14	8.00
8302	.11	35.00
8308	.67	206.00

• ROUTE = 3D UC COMMOD = 543 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.79	294.00

• ROUTE = 3D UC COMMOD = 532 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.01	5.00
8302	.01	2.00
8303	.20	24.00
8304	.07	16.00
8305	.28	64.00
8306	.06	5.00
8307	.00	2.00
8308	.01	3.00
8310	.15	39.00

• ROUTE = 3D UC COMMOD = 772 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.09	14.00
8303	.04	2.00
8304	.01	4.00
8305	.55	152.00
8308	.06	3.00
8311	.01	1.00

• ROUTE = 3D UC COMMOD = 340 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.25	69.00
8306	.25	69.00
8312	.25	69.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 15 of 21 pages)

• ROUTE = 3D UC COMMOD = 763 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.70	261.00

• ROUTE = 3D UC COMMOD = 509 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.67	25.00

• ROUTE = 3D UC COMMOD = 450 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.24	26.00
8309	.18	12.00
8310	.25	56.00

• ROUTE = 3D UC COMMOD = 585 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.61	90.00

• ROUTE = 3D UC COMMOD = 656 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.17	27.00
8306	.42	82.00

• ROUTE = 3D UC COMMOD = 746 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.52	13.00

• ROUTE = 3D UC COMMOD = 743 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.29	5.00
8304	.04	1.00
8306	.19	8.00

• ROUTE = 3D UC COMMOD = 706 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.30	30.00
8305	.09	8.00
8306	.02	4.00
8311	.01	2.00
8312	.07	9.00

• ROUTE = 3D UC COMMOD = 643 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.47	150.00

• ROUTE = 3D UC COMMOD = 709 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.05	4.00
8305	.12	27.00
8306	.11	17.00
8307	.04	5.00
8311	.10	24.00
8312	.05	9.00

• ROUTE = 3D UC COMMOD = 65A SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	12.00
8302	.05	12.00
8305	.10	31.00
8308	.03	8.00
8311	.17	19.00

• ROUTE = 3D UC COMMOD = 730 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.36	33.00

• ROUTE = 3D UC COMMOD = 765 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.35	42.00

• ROUTE = 3D UC COMMOD = 505 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.35	18.00

• ROUTE = 3D UC COMMOD = 573 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.01	1.00
8309	.28	14.00
8311	.04	2.00

• ROUTE = 3D UC COMMOD = 702 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.06	14.00
8306	.15	29.00
8307	.04	8.00
8309	.06	9.00
8311	.02	8.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 16 of 21 pages)

• ROUTE = 3D UC COMMOD = 631 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.29	25.00

• ROUTE = 3D UC COMMOD = 734 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.14	35.00
8307	.14	32.00

• ROUTE = 3D UC COMMOD = 620 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8302	.04	4.00
8304	.06	8.00
8305	.03	2.00
8306	.03	4.00
8307	.10	7.00
8308	.02	3.00

• ROUTE = 3D UC COMMOD = 684 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.19	38.00

• ROUTE = 3D UC COMMOD = 733 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.15	44.00

• ROUTE = 3D UC COMMOD = 767 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.11	181.00

• ROUTE = 3D UC COMMOD = 732 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.02	4.00
8306	.01	1.00
8310	.08	26.00

• ROUTE = 3D UC COMMOD = 535 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.09	17.00

• ROUTE = 3D UC COMMOD = 531 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.05	6.00

• ROUTE = 3D UC COMMOD = 590 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00
8308	.03	1.00

• ROUTE = 3D UC COMMOD = 574 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.03	1.00

• ROUTE = 3D UC COMMOD = 653 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.01	2.00
8310	.01	1.00

• ROUTE = 3D UC COMMOD = 572 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.02	5.00

• ROUTE = 3D UC COMMOD = 744 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.01	2.00

• ROUTE = 3D UC COMMOD = 759 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.01	1.00

• ROUTE = 3D UL COMMOD = 692 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	194.80	43014.00

• ROUTE = 3D UL COMMOD = 686 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	85.70	17140.00

• ROUTE = 3D UL COMMOD = 700 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.66	114.00
8308	13.32	2736.00
8311	.50	113.00

• ROUTE = 3D UL COMMOD = 576 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	10.29	3364.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 17 of 21 pages)

• ROUTE = 3D UP COMMOD = 713 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	6.48	511.00

• ROUTE = 3D UP COMMOD = 518 SHP MTHS = 11

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	64.04	3912.00
8302	32.92	2182.00
8303	50.70	3641.00
8304	27.04	1730.00
8305	47.95	2766.00
8307	32.38	1783.00
8308	51.50	3252.00
8309	100.02	5920.00
8310	41.32	2398.00
8311	65.00	4139.00
8312	61.07	3637.00

• ROUTE = 3D UP COMMOD = 395 SHP MTHS = 10

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	1.70	410.00
8303	8.56	2295.00
8304	9.59	2117.00
8305	4.85	1254.00
8307	4.46	1105.00
8308	6.72	2502.00
8309	1.03	233.00
8310	3.12	966.00
8311	3.61	945.00
8312	10.37	2669.00

• ROUTE = 3D UP COMMOD = 701 SHP MTHS = 12

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	.36	21.00
8301	3.41	231.00
8302	.59	58.00
8303	21.56	1747.00
8304	4.39	350.00
8305	9.26	716.00
8306	2.95	309.00
8307	2.87	647.00
8308	2.64	237.00
8309	1.10	430.00
8310	.27	26.00
8311	.82	83.00

• ROUTE = 3D UP COMMOD = 561 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	14.53	828.00
8304	10.90	616.00

• ROUTE = 3D UP COMMOD = 621 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.02	2.00
8307	10.46	457.00
8311	3.16	139.00
8312	9.54	379.00

• ROUTE = 3D UP COMMOD = 635 SHP MTHS = 9

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.96	33.00
8303	.35	30.00
8304	3.26	136.00
8306	.16	10.00
8307	3.97	179.00
8308	1.64	97.00
8309	3.97	169.00
8310	.57	23.00
8312	6.47	363.00

• ROUTE = 3D UP COMMOD = 713 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.50	265.00
8305	9.80	700.00
8311	.94	120.00

• ROUTE = 3D UP COMMOD = 605 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	10.90	560.00

• ROUTE = 3D UP COMMOD = 725 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	.16	45.00
8303	2.62	855.00
8304	5.74	1813.00

• ROUTE = 3D UP COMMOD = 700 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.29	75.00
8302	.57	19.00
8303	4.64	217.00
8304	1.02	103.00
8308	.17	46.00
8309	.01	2.00
8311	1.69	302.00

• ROUTE = 3D UP COMMOD = 867 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	8.09	2768.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 18 of 21 pages)

• ROUTE = 3D UP COMMOD = 500 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	3.00	234.00
8304	2.43	120.00
8311	1.58	119.00

• ROUTE = 3D UP COMMOD = 390 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.80	225.00
8305	2.58	592.00
8306	.46	38.00
8307	.82	196.00
8308	.94	194.00
8309	.57	196.00
8310	.31	134.00
8312	.06	11.00

• ROUTE = 3D UP COMMOD = 513 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.42	41.00
8309	2.00	118.00
8311	2.38	91.00

• ROUTE = 3D UP COMMOD = 730 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	.36	67.00
8311	3.97	179.00

• ROUTE = 3D UP COMMOD = 504 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	3.69	174.00
8305	.33	18.00

• ROUTE = 3D UP COMMOD = 761 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	2.75	1500.00
8310	1.20	475.00
8312	.02	8.00

• ROUTE = 3D UP COMMOD = 772 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	2.02	485.00
8303	.12	60.00
8305	.53	158.00
8306	.17	38.00

• ROUTE = 3D UP COMMOD = 450 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.71	172.00
8306	.08	20.00

• ROUTE = 3D UP COMMOD = 720 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8308	1.02	336.00
8309	1.55	439.00

• ROUTE = 3D UP COMMOD = 643 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	2.46	537.00

• ROUTE = 3D UP COMMOD = 592 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	2.43	140.00
8303	.31	24.00

• ROUTE = 3D UP COMMOD = 560 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	2.02	122.00

• ROUTE = 3D UP COMMOD = 753 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.05	12.00
8304	.41	59.00
8308	1.53	154.00

• ROUTE = 3D UP COMMOD = 756 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.84	66.00
8305	.17	16.00
8307	.47	92.00
8311	.42	35.00

• ROUTE = 3D UP COMMOD = 721 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.28	44.00
8308	1.59	60.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 19 of 21 pages)

• ROUTE = 3D UP COMMOD = 591 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.22	71.00
8306	.62	53.00
8307	.41	40.00
8310	.04	8.00
8312	.50	47.00

• ROUTE = 3D UP COMMOD = 729 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.57	38.00
8310	.58	44.00

• ROUTE = 3D UP COMMOD = 534 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8212	.22	38.00
8304	.31	31.00
8307	.10	41.00
8308	.45	156.00
8309	.03	10.00
8310	.00	1.00
8312	.02	5.00

• ROUTE = 3D UP COMMOD = 712 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.02	8.00
8311	.98	165.00

• ROUTE = 3D UP COMMOD = 705 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.30	4.00
8303	.00	4.00
8309	.74	54.00
8311	.00	1.00

• ROUTE = 3D UP COMMOD = 759 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.32	31.00
8312	.17	35.00

• ROUTE = 3D UP COMMOD = 737 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.32	32.00

• ROUTE = 3D UP COMMOD = 767 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.30	100.00

• ROUTE = 3D UP COMMOD = 658 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8306	.09	15.00
8308	.15	21.00

• ROUTE = 3D UP COMMOD = 733 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.16	68.00

• ROUTE = 3D UP COMMOD = 65A SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.00	1.00
8307	.12	42.00

• ROUTE = 3D UP COMMOD = 576 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.04	8.00
8304	.00	1.00
8307	.00	1.00
8310	.07	12.00

• ROUTE = 3D UP COMMOD = 634 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.11	8.00

• ROUTE = 3D UP COMMOD = 710 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.09	6.00

• ROUTE = 3D UP COMMOD = 595 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.08	4.00

• ROUTE = 3D UP COMMOD = 758 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8304	.05	18.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List (page 20 of 21 pages)

* ROUTE = 3D UP COMMOD = 620 SHP MTHS = 3

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	.00	1.00
8308	.04	3.00
8312	.01	1.00

* ROUTE = 3D UP COMMOD = 651 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8307	.04	26.00

* ROUTE = 3D UP COMMOD = 723 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8305	.04	8.00

* ROUTE = 3D UP COMMOD = 715 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.02	2.00

* ROUTE = 3D UP COMMOD = 532 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.02	7.00

* ROUTE = 3D UP COMMOD = 706 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	1.00
8312	.00	1.00

* ROUTE = 3D UP COMMOD = 530 SHP MTHS = 2

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8311	.00	1.00
8312	.00	1.00

Figure F-8. Oakland to Japan/Korea Cargo Distribution List
(page 21 of 21 pages)

F-12. OAKLAND TO GERMANY

a. The following water port identifiers were used to develop a surface route to parallel the air route Travis/Tinker-Europe:

(ZD3 to JF6)	(ZDC to JF6)	(3D3 to JF1)
(ZD3 to JF1)	(ZD3 to JF6)	
(ZDC to JF1)	(ZE1 to JF1)	

The ports that were used to evaluate this route were Oakland to Bremerhaven and New Orleans to Bremerhaven.

(1) The total amount of TP-1 cargo shipped was .92 STON. The majority of TP-1 cargo was electronic equipment.

(2) The total amount of TP-2 and TP-3 cargoes shipped was 109 STON, and 100 percent was POV. This commodity was not eligible to be diverted to airlift.

b. Only .7 percent of the Army's unsubscribed capacity allocation, or .92 STON, could be diverted from surface to airlift on this route (Figure F-9).

c. Cost avoidance for the route is as follows:

$$\begin{array}{c} \text{Cost} \\ \text{avoidance} \\ (\$) \end{array} = \begin{array}{c} \text{Divertible} \\ \text{cargo} \\ (\text{MTON}) \end{array} \times \left(\begin{array}{c} \text{Surface} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} - \begin{array}{c} \text{Airlift} \\ \text{transportation} \\ (\$/\text{MTON}) \end{array} \right)$$

$$= 6 \times (150.70 - 130.40)$$

$$= 122$$

TP1

• ROUTE = 2D JF COMMOD = 745 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8309	.43	123.00

• ROUTE = 2D JF COMMOD = 39C SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.30	83.00

• ROUTE = 2D JF COMMOD = 65A SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8310	.15	30.00

• ROUTE = 2D JF COMMOD = 658 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8302	.01	4.00

TP2

• ROUTE = 2E JF COMMOD = 350 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	1.55	560.00

• ROUTE = 3D JF COMMOD = 320 SHP MTHS = 6

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	18.97	5438.00
8301	51.16	14695.00
8302	50.31	14336.00
8303	11.85	3333.00
8308	19.77	5725.00
8312	10.55	3136.00

TP3

• ROUTE = 3D JF COMMOD = 350 SHP MTHS = 4

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	6.38	1791.00
8302	13.40	3494.00
8308	4.41	1299.00
8312	1.83	740.00

• ROUTE = 3D JF COMMOD = 352 SHP MTHS = 5

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8213	3.12	880.00
8301	2.66	725.00
8302	1.37	385.00
8303	1.48	350.00
8308	3.20	1185.00

• ROUTE = 3D JF COMMOD = 340 SHP MTHS = 1

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8301	.50	138.00

• ROUTE = 2E JF COMMOD = 320 SHP MTHS = 8

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	95.05	27162.00
8304	57.90	16170.00
8305	120.56	35115.00
8306	87.27	24996.00
8307	96.80	27904.00
8308	139.25	39785.00
8309	91.71	26305.00
8310	5.26	1489.00

• ROUTE = 2E JF COMMOD = 350 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	12.97	4330.00
8304	6.54	2263.00
8305	14.09	4559.00
8306	15.95	5280.00
8307	21.08	7447.00
8308	22.50	8219.00
8309	15.42	5541.00

• ROUTE = 2E JF COMMOD = 352 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	2.85	700.00
8304	1.90	440.00
8305	2.24	510.00
8306	6.01	1542.00
8307	1.42	350.00
8308	1.92	621.00
8309	3.16	912.00

• ROUTE = 2E JF COMMOD = 340 SHP MTHS = 7

YRMO	WEIGHT (TONS)	VOLUME (CU FT)
8303	1.30	457.00
8304	.25	69.00
8305	.75	263.00
8306	.50	194.00
8307	.72	263.00
8308	.77	263.00
8309	.44	194.00

Figure F-9. Oakland-Germany Cargo Distribution List

F-13. SUMMARY. Table F-7 portrays a summary of the results from diverting only surface port-packed cargoes that are air eligible.

Table F-7. FY 84 Cargo/Route Selection Results - Surface Port-packed

Routes	Army unsubscribed capacity allocation (STON)	Port-packed cargo (STON)		Cost avoidance ($)
		Available	Diverted	
Dover-Rhein Main/ Ramstein	2,580	472	472	34,538
Travis-Yokota/Osan	500	4,008	500	11,625
Dover-Incirlik	315	206	206	6,084
Travis-Kadena	105	71	71	5,446
Dover-Dhahran	375	2	2	1,719
Norfolk-Rota/Sigonella	20	1,000	20	1,202
Norfolk-Rota/Bahrain	5	0	0	0
Travis-Clark/Diego Garcia	75	8	8	127
Travis/Tinker-Germany	140	1	1	122
Charleston-Howard	250	0	0	0
Travis-Hickam/Guam/ Subic/Clark	90	764	90	(743)
Total	4,455	6,532	1,370	60,120

APPENDIX G

MAC COMMODITY PER ROUTE DATA (AIRLIFT)

G-1. ROUTE DATA

a. This appendix is designed to provide a historical data base of Army cargo shipments on MAC incentive tariff routes and an analysis of the commodities lifted per route. The following is the sequence of routes.

(1) Dover to Frankfurt and Ramstein, FRG.

(2) Dover to Dhahran, Saudi Arabia.

(3) Dover to Incirlik, Turkey.

(4) Norfolk to Rota, Spain and Sigonella, Italy.

(5) Norfolk to Bahrain.

(6) Charleston to Howard, Panama.

(7) Travis to Hickam, Hawaii, Clark and Subic Bay, Philippine Islands.

(8) Travis to Diego Garcia.

(9) Travis to Kadena, Okinawa.

(10) Travis to Osan, Korea and Yokota, Japan.

(11) Tinker to Frankfurt and Ramstein, FRG.

b. The data base, as defined in Chapter 6, paragraph 6-3, was acquired from MAC and contains lift information of Army shipments by commodity, type, and amount for FY 81-FY 83. The figures contain a listing of all Army commodities per MILSTAMP air commodity code for each route. Each route was analyzed to determine the amounts and type of commodities lifted on each air route.

G-2. DOVER TO FRANKFURT AND RAMSTEIN

a. Dover to Frankfurt. The total weight was 53,436 STON. The largest commodity (by weight) shipped over this route was vehicles (26 percent), followed by unaccompanied baggage (2 percent) and signal equipment and supplies (1 percent). The following were significant commodities: weapons, printed forms, publications and drawings, and aircraft supplies and equipment. Figure G-1 depicts the trends of these significant commodities. The remaining commodities are illustrated on Figure G-2.

b. Dover to Ramstein. The total weight transported was 35,378 STON. The largest commodity (by weight) shipped was vehicles (23 percent) followed by signal equipment and supplies (2 percent). The other significant commodities were aircraft supplies and equipment, chemical supplies and clothing, and weapons. The 6-month trends of these commodities are illustrated in Figure G-3. The other remaining commodities are displayed in Figure G-4.

G-3. DOVER TO DHAHRAN, SAUDI ARABIA. The total weight transported was 3,437 STON. The largest commodity (by weight) shipped over this route was rations and subsistence (11 percent), followed by unaccompanied baggage (2 percent) and HHG (5 percent). The next significant commodity was personnel services (2 percent). The only significant military related commodity was communications equipment and supplies. The overall analysis is that this route was used for personal items to support the noncombatant. Figure G-5 depicts the trend of these significant commodities. The remaining commodities are illustrated on Figure G-6.

G-4. DOVER TO INCIRLIK, TURKEY. The total weight of cargo shipped was 2,370 STON. The largest commodity (by weight) shipped over this route was vehicles (19 percent), followed by mail (185 STON), even though it was transported only for 7 months. As with all the selected routes, unaccompanied baggage was one of the top (by weight) three commodities shipped. The two remaining major commodities carried on this route were personnel-oriented items, troop clothing, and personnel services. The remaining commodities are illustrated in Figures G-7 and G-8.

G-5. NORFOLK TO ROTA/SIGONELLA. This route is used to a small degree by the Army, as seen in the Army's FY 84 unsubscribed airlift capacity of only 20 STON. The heaviest (by weight) commodity carried was mail (82 STON), yet this commodity was carried only for 4 months in the middle of FY 83. The next heaviest commodity was communications equipment and supplies (13 STON). The only commodity with a definite monthly demand was unaccompanied baggage.

G-6. NORFOLK TO BAHRAIN. The total weight carried on this route was 52 STON. This route is also a small route, used very little by the Army, with an FY 84 unsubscribed airlift capacity of only 4 STON. The only significant commodities transported were mail and unaccompanied baggage. The two commodities account for 28 percent of the total, and each commodity contributed 26 percent and 1 percent, respectively. No commodity had a constant/monthly demand.

G-7. CHARLESTON TO HOWARD. The total weight of cargo transported was 3,881 STON. This route carried a wide range of commodities, the heaviest being the following: vehicles, 396 STON; unaccompanied baggage, 257 STON; medical equipment and supplies, 129 STON; communications equipment and supplies, 120 STON; and personnel services, 102 STON. The major significant observation for this route is that the trends for the commodities are increasing (see Figure G-9). The remaining commodities are illustrated on Figure G-10.

G-8. TRAVIS TO HICKAM/GUAM/CLARK/SUBIC

a. This is the second largest route leaving Travis. The total weight carried was 5,382 STON; the weight on the Travis-Hickam route was 5,138 STON. The largest recipient of cargo was Hickam, followed by Clark, Guam, and Subic. The only significant commodity carried on all segments of the route was unaccompanied baggage (6 percent of the total route's weight). The largest commodity carried on any route was aircraft supplies and equipment to Hickam (512 STON) (see Figure G-11).

b. The Travis-Clark route carried 165 STON, and its largest commodity was communication equipment and supplies (3 percent of this segment's total). Other significant commodities were aircraft equipment and supplies, 3 percent; unaccompanied baggage, 2 percent; and vehicles, 6 percent of this route's cargo (see Figure G-12). The Travis-Guam route carried 58 STON, and the largest commodity was unaccompanied baggage (15 percent of this segment's total route). The other significant commodities shipped were communication equipment and supplies (5 percent) and aircraft supplies and equipment (3 percent) of this route's cargo (see Figure G-13). The Travis-Subic route carried 20 STON, and the largest commodity was medical supplies (14 percent of this segment's route cargo). The remaining commodities shipped were unaccompanied baggage (13 percent) and aircraft supplies (7 percent of this segment's route cargo) (see Figure G-14). Figure G-15 displays the trend of the significant commodities on the only major portion of this route, Travis to Hickam. Figure G-16 displays the trends of three commodities on the Travis to Clark route.

G-9. TRAVIS TO DIEGO GARCIA. The total cargo carried on this route was 37 STON. The largest commodity was mail (86 percent), and communications equipment and supplies accounted for 8 percent of the total cargo. The remaining commodities are illustrated on Figure G-17.

G-10. TRAVIS TO KADENA. The total cargo carried on this route was 242 STON, and the largest commodity shipped was vehicles (36 percent). The other significant commodities were aircraft supplies and equipment (5 percent) and communications equipment and supplies (5 percent of the route's cargo). Figure G-18 displays the trend of vehicles. The remaining commodities are illustrated on Figure G-19.

G-11. TRAVIS TO YOKOTA AND OSAN

a. Travis to Korea. This is the largest route leaving Travis. The total weight carried (Travis to Osan/Yokota) was 12,503 STON. The largest destination was Korea (12,439 STON). The heaviest commodity carried on this route (Travis-Osan) was vehicles; 8 percent of the total cargo. The following other commodities were aircraft equipment and supplies (6 percent) of the total (Travis-Osan) cargo. The remaining commodities are listed on Figure G-20. Figure G-21 displays the trend of vehicles and aircraft equipment.

b. Travis to Yokota. This portion of the route carried 64 STON--5 percent of the total route. The heaviest commodity carried was communication equipment--13 STON, followed by aircraft equipment and supplies--1 STON. The trends are displayed on Figure G-22, indicating the relative constant shipment of these two commodities. Figure G-23 contains the remaining commodities, listing the weight and monthly shipments.

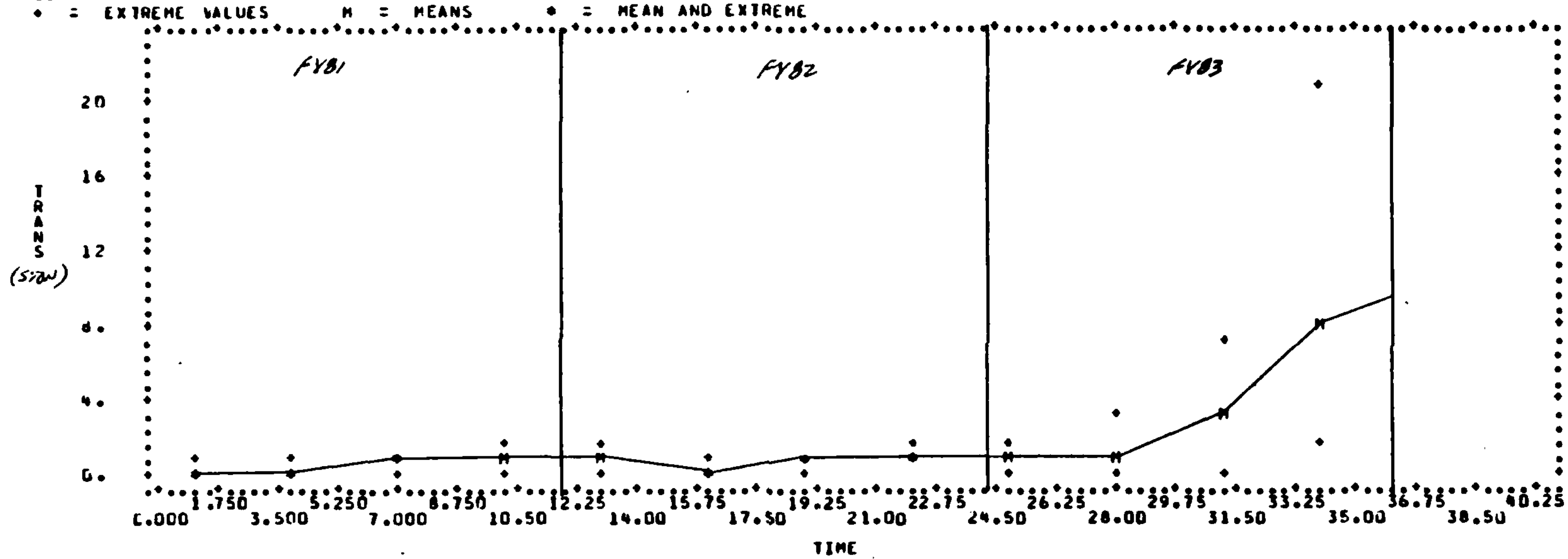
G-12. TRAVIS/TINKER TO RAMSTEIN/FRANKFURT

a. Tinker to Frankfurt. The total cargo carried on this route (Tinker to Frankfurt/Ramstein) was 4,569 STON, and the heaviest commodity was unaccompanied baggage (1,021 STON). The total weight carried by the Tinker-Frankfurt route was 2,641 STON. The types of commodities carried on both segments of the route were aircraft equipment and supplies and communication supplies and equipment. The Tinker to Frankfurt route segment carried the heaviest amount of cargo, 58 percent of the total cargo. The remaining commodities are illustrated on Figure G-24. The trends of unaccompanied baggage and vehicles are displayed on Figure G-25.

b. Tinker to Ramstein. The total cargo carried on this route was 1,928 STON, and the heaviest commodity was unaccompanied baggage, 20 percent of the total route. The trends of aircraft supplies, vehicles and equipment, and communication equipment are plotted on Figure G-26. The total listing of remaining commodities is found in Figure G-27.

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

+ = EXTREME VALUES   M = MEANS   * = MEAN AND EXTREME

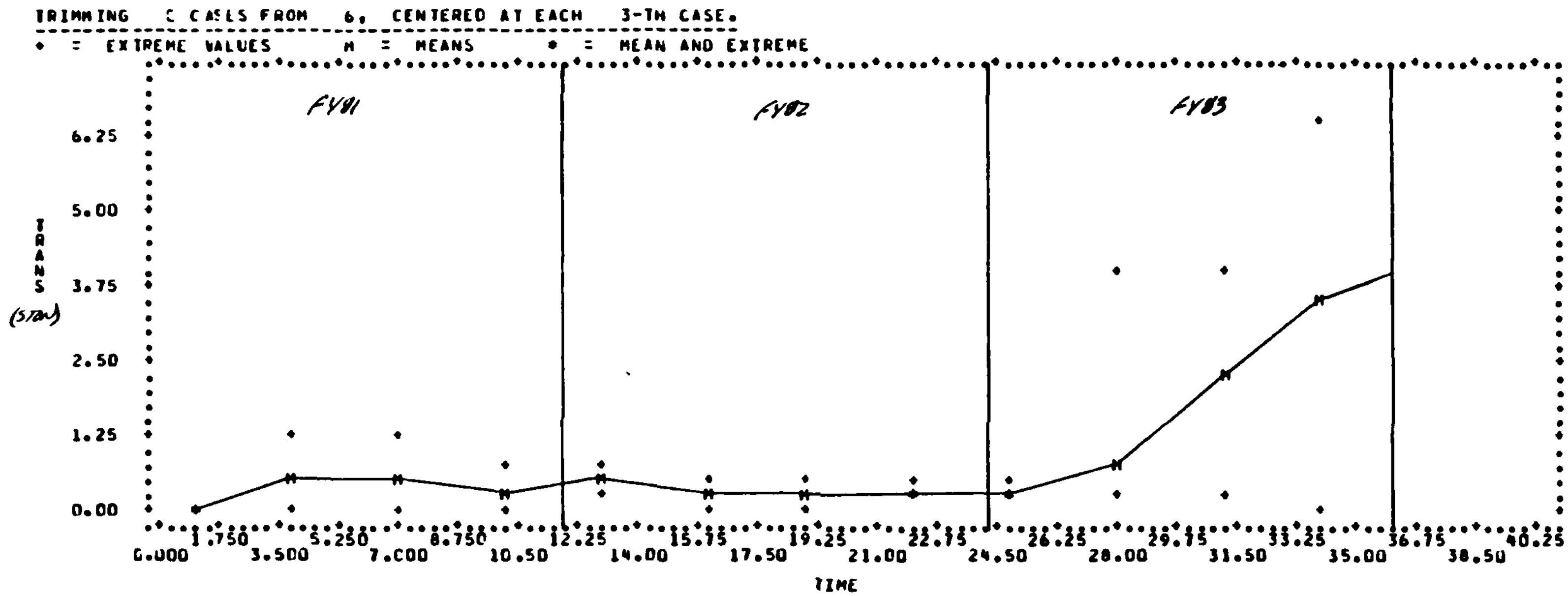


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.2752	.5115
4.000	6	.0000	.3094	.5115
7.000	6	.2345	.4384	.7240
10.000	6	.2985	.7150	1.4900
13.000	6	.3565	.6816	1.4900
16.000	6	.2960	.3937	.6320
19.000	6	.2960	.4033	.5585
22.000	6	.4060	.7262	1.4025
25.000	6	.3495	.7378	1.4025
28.000	6	.3240	.9450	3.1085
31.000	6	.3240	2.9193	7.4240
34.000	6	1.5725	7.6108	20.6830

A

0	1264	797
628	821	1677
1023	713	699
469	614	646
982	600	1302
611	592	6217
1448	1117	14648
1154	1105	7147
597	612	4670
1415	1192	3145
2960	1664	41366
986	2815	15954

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 1 of 6 pages)

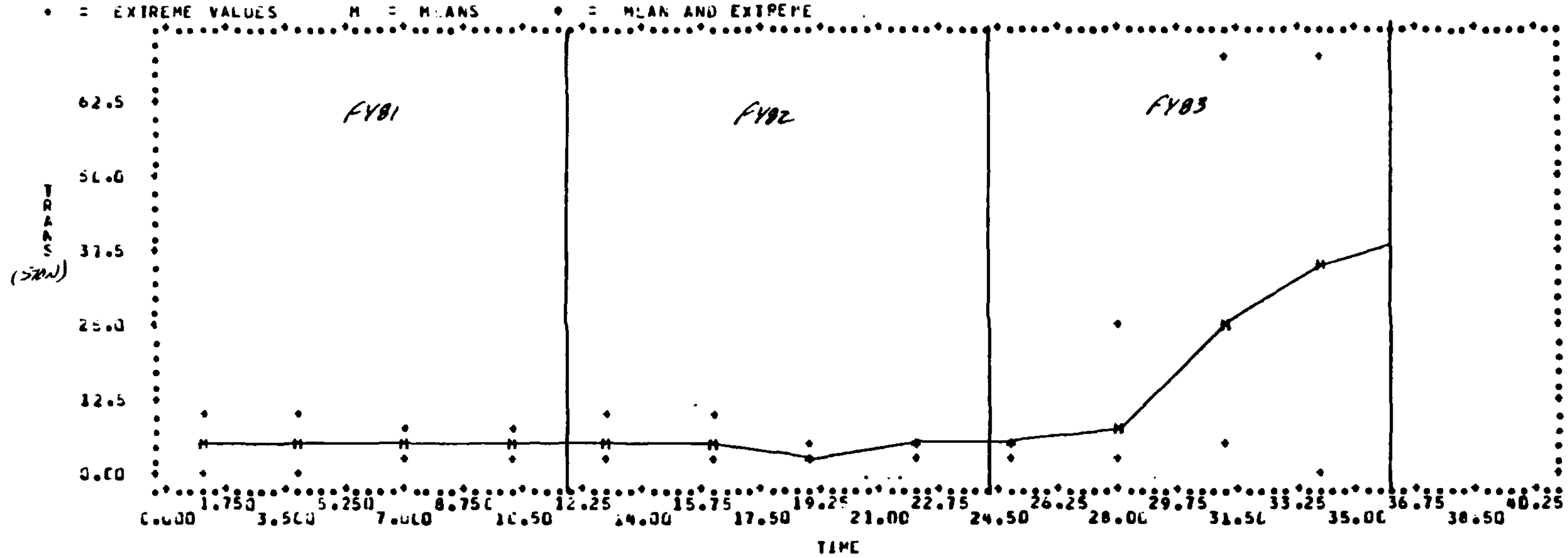


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	C		
1.000	3	.0045	.0257	.0630	9	347	345
4.000	6	.0045	.3881	1.1530	1261	668	401
7.000	6	.0605	.4207	1.1530	19	657	313
10.000	6	.0605	.2880	.6605	2316	554	257
13.000	6	.1735	.3986	.6605	1850	132	567
16.000	6	.0660	.2993	.5170	317	1034	8225
19.000	6	.0660	.2625	.5170	154	509	7734
22.000	6	.1290	.2538	.5230	270	344	3030
25.000	6	.1290	.2232	.5230	121	577	6982
28.000	6	.1265	.8427	4.1125	1037	1046	6602
31.000	6	.1285	2.2329	4.1125	553	256	10222
34.000	6	.0000	3.4347	6.6245	1321	312	13249

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 2 of 6 pages)

TRIMMING 2 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

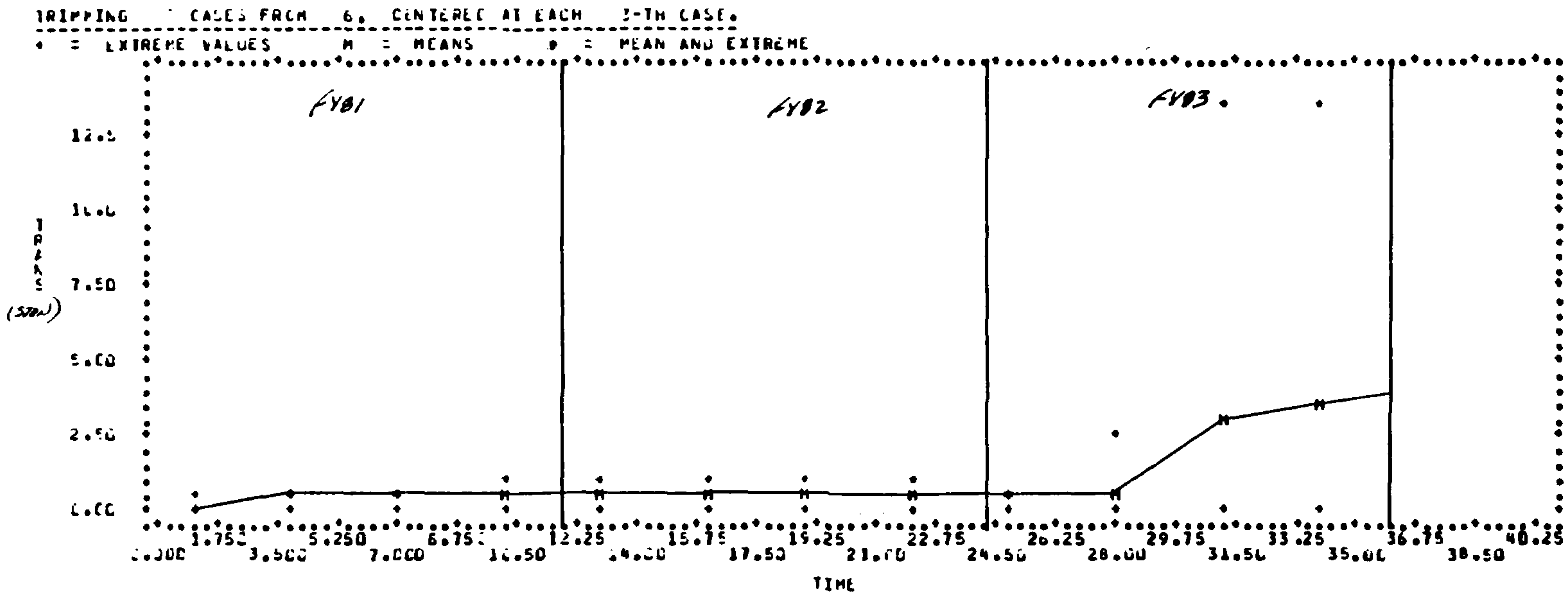
* = EXTREME VALUES   M = MEANS   * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	3.7537	9.2963
4.000	6	.0000	4.8769	9.2963
7.000	6	1.4920	4.9669	7.5370
10.000	6	1.4920	5.2834	8.4895
13.000	6	2.0755	6.0543	10.2463
16.000	6	2.0755	4.5595	10.2463
19.000	6	1.6110	3.3364	5.2865
22.000	6	1.6110	3.9369	6.1093
25.000	6	2.6635	3.9673	6.1093
28.000	6	2.8835	7.9192	24.5730
31.000	6	4.1365	24.8222	69.2595
34.000	6	.0000	34.7434	69.2595

H		
0	21492	5792
18592	4157	5767
3912	8116	7561
15014	6776	8277
6246	8504	18494
14757	4559	49140
11891	3222	55353
6719	4363	28183
2544	10573	138419
16579	12218	137316
15347	7594	136213
7491	8512	56753

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 3 of 6 pages)



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.1290	.1957	.2600
4.000	6	.1250	.2507	.3250
7.000	6	[illegible]	.2615	[illegible]
10.000	6	[illegible]	[illegible]	.9845
13.000	6	.1465	.4964	.9845
16.000	6	.1995	.4956	1.0415
19.000	6	.1720	.4849	1.0415
22.000	6	.1320	.3612	.7525
25.000	6	[illegible]	.3700	.5990
28.000	6	.1325	.6844	2.7105
31.000	6	.1325	3.0450	13.5540
34.000	5	[illegible]	3.2527	13.5540

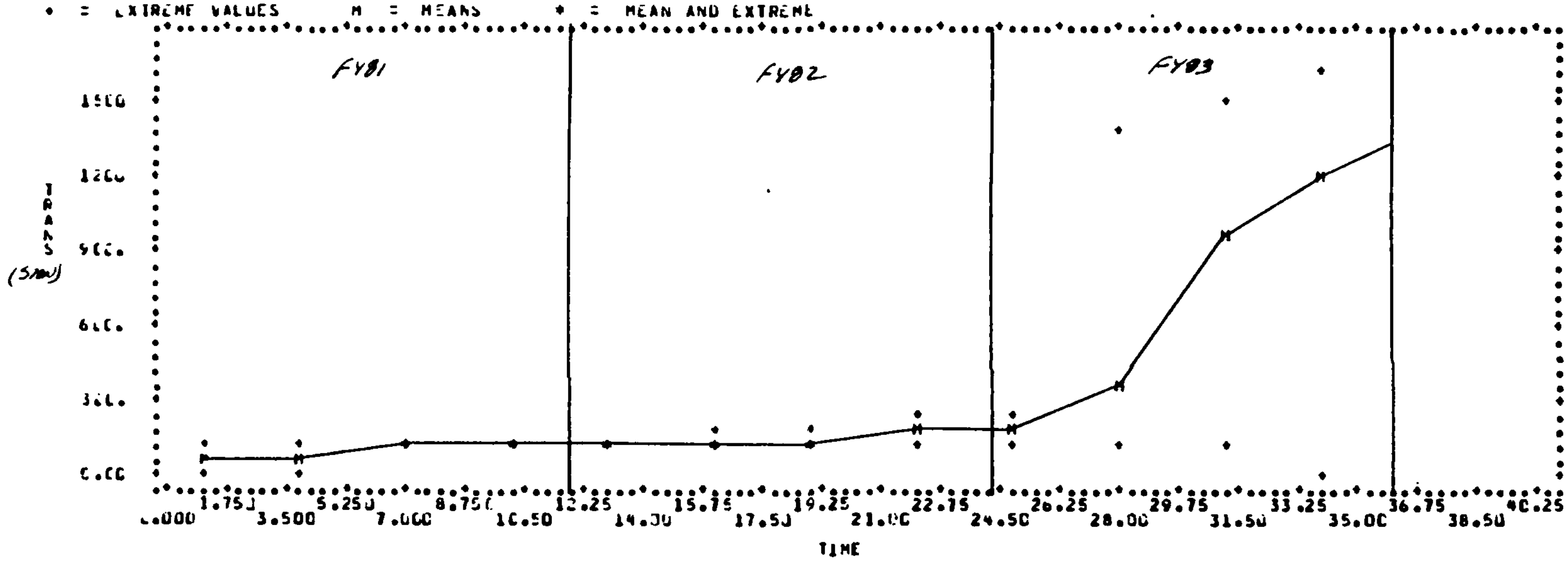
M

256	348	915
356	1163	793
560	782	360
650	689	264
589	2083	460
[illegible]	724	5421
571	434	2576
117	1005	27106
615	244	709
1569	543	3366
1352	631	6023
293	1198	2613

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 4 of 6 pages)

TRIMMING . CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS + = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.[illegible]0	3	.[illegible]40	62.1290	102.6215
4.[illegible]00	6	.[illegible]40	66.5513	113.6485
7.[illegible]00	6	108.9315	114.0442	129.4[illegible]8[illegible]
1[illegible].[illegible]	6	108.9315	12[illegible].63[illegible]4	148.825[illegible]
1[illegible].[illegible]	6	99.5[illegible]	123.6[illegible]31	148.8[illegible]5[illegible]
1[illegible].[illegible]	6	99.5[illegible]0	122.9795	158.172[illegible]
19.[illegible]	6	126.67[illegible]	145.62[illegible]7	171.117[illegible]
2[illegible].0[illegible]0	6	124.2[illegible]5	163.135C	229.649[illegible]
2[illegible]	6	124.21[illegible]5	[illegible]4.3[illegible]2	229.649[illegible]
2[illegible]	6	[illegible]7.317[illegible]	344.1[illegible]1	1371.974[illegible]
3[illegible]	6	[illegible]27.3[illegible]7[illegible]	949.74[illegible]3	1487.3765
34.[illegible]0	6	10.33[illegible]51	2[illegible]5.5[illegible]45	1622.1625

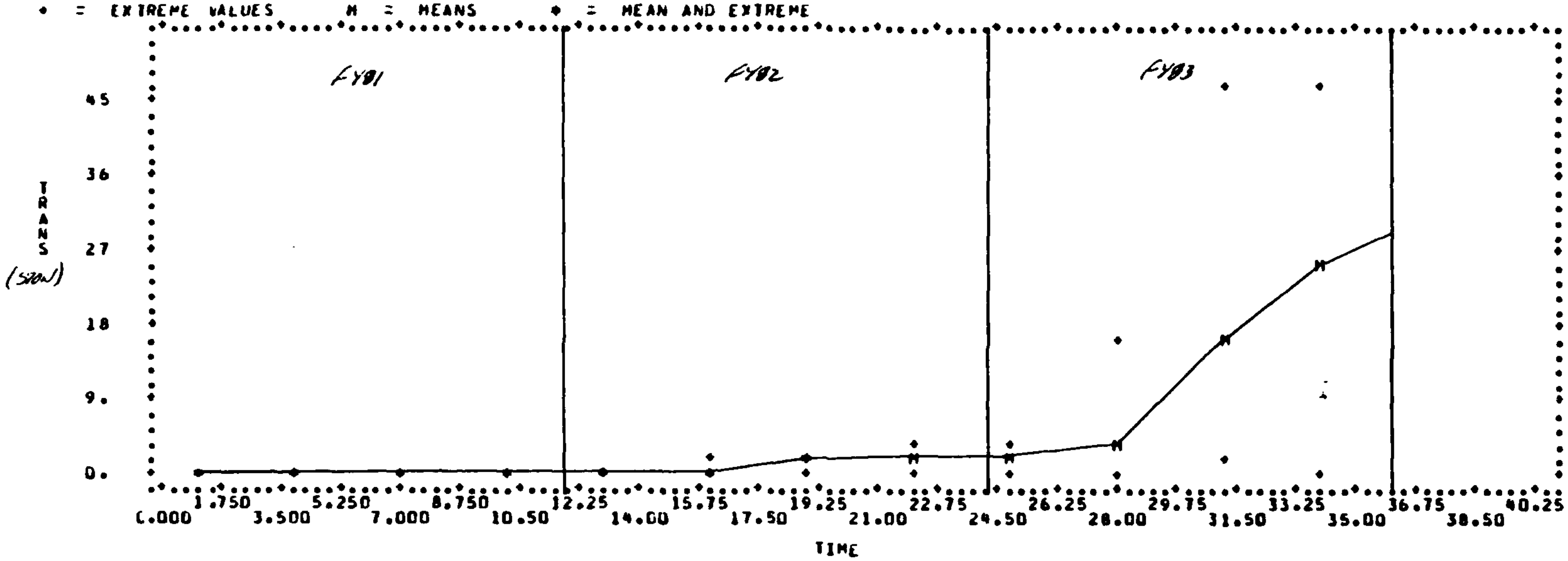
V

8	223423	414716
167523	199136	249855
205243	219922	263849
21F618	257340	243217
219977	255589	214634
227297	311344	2743946
217[illegible]3	342234	2974753
25[illegible]616	3[illegible]30	2476507
22[illegible]16	271435	2743625
297[illegible]0	24[illegible]421	2875442
29[illegible]913	33[illegible]712	3007059
2[illegible]313	45[illegible]98	3244325

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 5 of 6 pages)

TRIMMING C CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0000	.0000
4.000	6	.0000	.0000	.0000
7.000	6	.0000	.0310	.0060
10.000	6	.0000	.0040	.0180
13.000	6	.0000	.1529	.6960
16.000	6	.0180	.6122	1.4270
19.000	6	.3875	1.0432	1.7470
22.000	6	.7155	1.6563	2.7935
25.000	6	.7670	1.9189	2.8750
28.000	6	.7670	4.3918	15.6745
31.000	6	2.4645	15.9919	47.6095
34.000	6	.0000	25.3702	47.6095

2

0	36	2837
0	371	5756
0	1352	1534
0	1919	6303
0	775	4929
0	[illegible]	31349
12	1471	27394
0	3494	26709
0	2145	95219
36	2356	79185
0	4963	63151
0	5517	91972

Figure G-1. Three-month Moving Average Schematic
(Dover - Frankfurt) (STON/month)
(page 6 of 6 pages)

B	E	G	K
0	0	10	0
12133	397	1018	246
1225	43	861	110
919	103	631	156
3423	0	1073	159
1389	560	570	0
616	7	423	90
5223	196	834	568
820	60	1369	222
246	18	1186	264
1376	43	1120	411
608	12	1370	3306
2295	46	948	359
1061	1614	384	98
481	158	10236	116
1444	170	9090	72
933	12	1208	322
266	261	2938	367
501	128	4732	650
517	6	494	44
2223	17	436	211
1143	598	568	21
1065	296	590	173
216	142	580	36
1126	0	2031	260
471	3	2655	17
754	8	1244	20
275	310	1741	122
373	596	517	17
5079	9757	11209	496
19557	7068	2472	3046
12930	19146	5497	5660
5944	593	112	1404
12330	1596	7414	865
18116	2600	10310	326
7497	2585	4797	16047

D	F	J	N
0	0	871	0
74	6	11186	0
32	4	12265	0
27	17	15609	0
74	6	13075	0
40	0	13054	0
0	0	16261	0
15	0	17571	0
0	462	26192	0
27	26	27115	0
17	33	30341	0
37	128	20459	0
34	4	20435	0
0	0	23153	0
35	0	25159	0
11	0	23289	0
50	0	22934	0
0	178	25542	0
17	0	21783	0
0	272	15814	0
35	0	19474	0
0	20	29292	0
52	3	27950	0
35	24	24268	0
7	0	36038	0
0	0	20365	0
0	1	19951	2
0	1	22595	0
0	0	14643	0
0	4216	160250	1
350	0	217741	0
0	3133	244117	0
0	0	241340	0
0	0	247414	0
0	210	252989	0
0	1119	209441	0

Figure G-2. Dover - Frankfurt Cargo Distribution List (STON/month)
(page 1 of 3 pages)

P	S	U	X
0	0	0	0
251	210	0	0
514	586	0	0
298	855	0	0
92	987	0	0
187	61	0	103
208	348	0	0
191	4	0	0
27	1800	0	0
77	43	0	0
67	0	0	0
439	592	0	20
87	56	0	0
203	9	0	0
708	80	0	0
115	80	0	0
748	377	0	30
167	25	0	0
1125	2151	0	0
358	1	0	0
569	2	0	0
38	84	0	0
112	0	0	0
304	446	0	0
142	102	0	0
38	198	0	0
169	122	0	159
774	921	0	0
171	629	0	0
1900	6267	0	0
1452	1354	300	0
2010	5167	0	0
520	11411	0	0
0	6421	0	0
3214	1431	0	0
5100		0	0

R	T	W	Y
0	0	3443	0
0	333	785	244
0	725	2010	438
0	269	342	293
0	2008	1601	142
0	308	3368	186
13	590	4490	5216
0	236	1014	288
0	1005	2775	570
0	538	3684	3604
0	239	616	5328
0	2395	613	429
0	1031	814	272
0	1199	4066	352
16	84	469	417
0	3299	0	377
0	678	0	536
0	831	0	306
0	0	0	206
0	748	0	616
0	662	0	284
0	624	0	453
0	833	0	247
0	1016	0	345
0	1216	0	3396
0	70	0	256
0	916	0	72
0	2325	0	576
124	103	0	131
0	14330	0	1427
0	8270	0	4858
0	0	0	3110
226	7132	0	2775
0	4423	0	4172
0	1715	0	5570
0	31917	0	4110

Figure G-2. Dover - Frankfurt Cargo Distribution List (STON/month)
(page 2 of 3 pages)

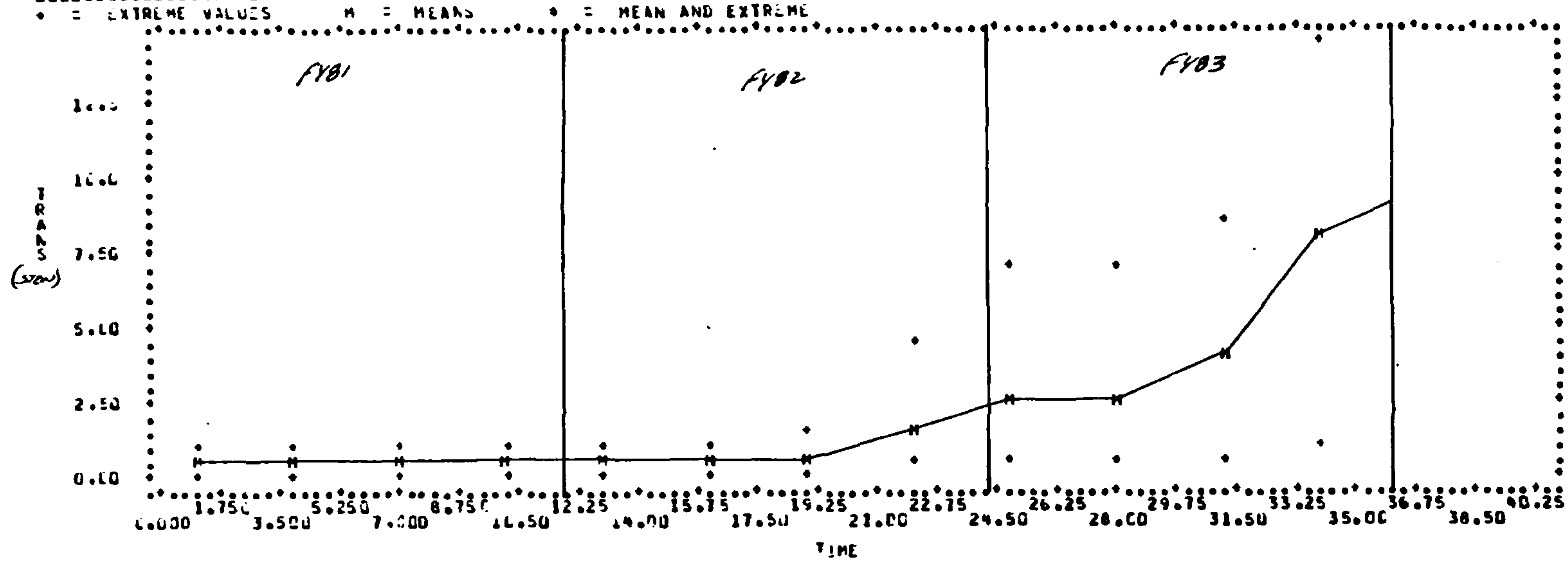
2	4
0	0
56	0
41	0
0	0
0	0
45	0
34	0
0	0
0	0
0	0
56	0
0	0
750	0
45	1
31	0
43	1
0	0
9	1593
19	0
0	0
400	0
0	0
41	0
0	0
0	0
0	17
0	20
0	0
0	7
0	1678
0	210
0	25
0	20
0	0
0	105
0	426

3	5
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
28	0
0	0
15	0
0	0
0	0
3	0
3	0
225	6
0	0
22	0
0	0
0	0
0	0
0	0
132	0
0	0
130	0
0	0
0	0
33	0
0	0

Figure G-2. Dover - Frankfurt Cargo Distribution List (STON/month)
(page 3 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



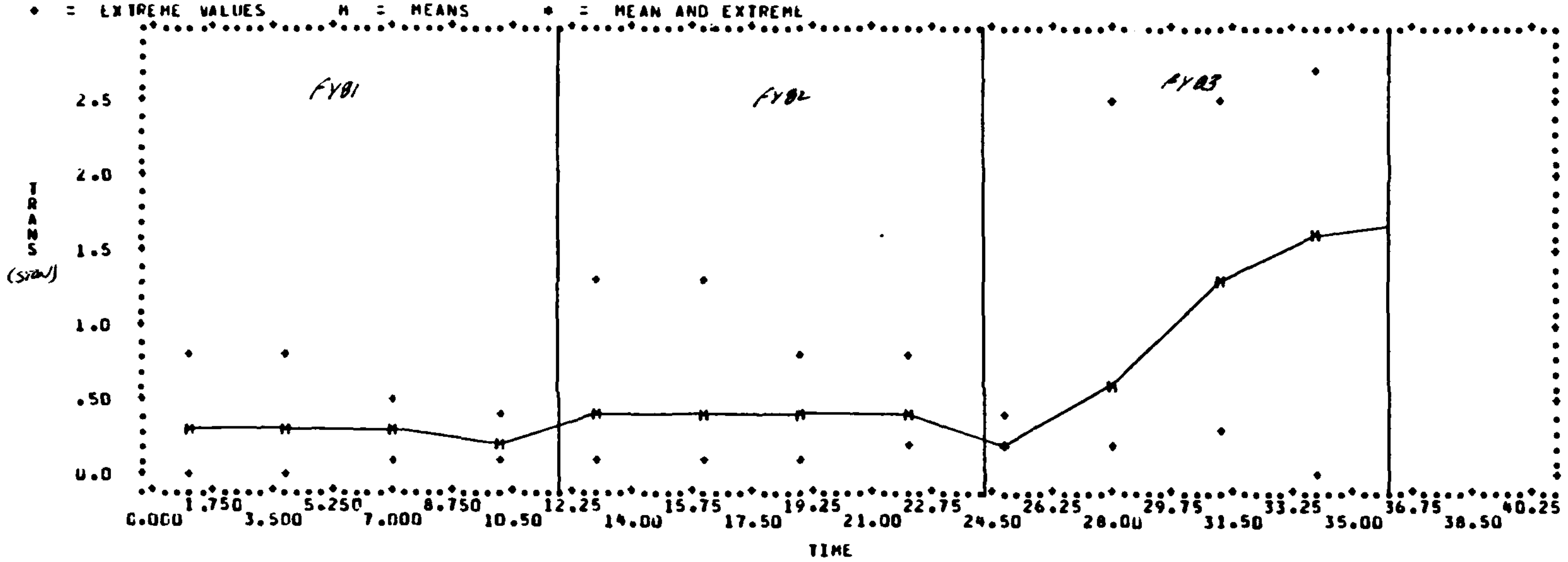
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.4503	1.1000
4.000	6	.0000	.3987	1.1000
7.000	6	.0000	.3750	1.0693
10.000	6	.0000	.5579	1.0693
13.000	6	.0965	.5222	.9440
16.000	6	.0965	.4249	.9965
19.000	6	.1770	.6942	1.5415
22.000	6	.2835	1.5516	4.4850
25.000	6	.5330	2.6292	7.1890
28.000	6	.3270	2.5439	7.1680
31.000	6	.3270	4.2097	6.6870
34.000	6	1.1650	8.1003	14.4310

A		
0	992	14376
562	193	2772
2210	865	1066
316	701	654
630	394	1189
1076	1993	10470
12	567	6886
328	1672	11943
2138	3083	17374
1088	1783	23116
914	2574	28662
1415	8970	27609

Figure G-3. Three-month Moving Average Schematic
(Dover - Ramstein) (STON/month)
(page 1 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

• = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



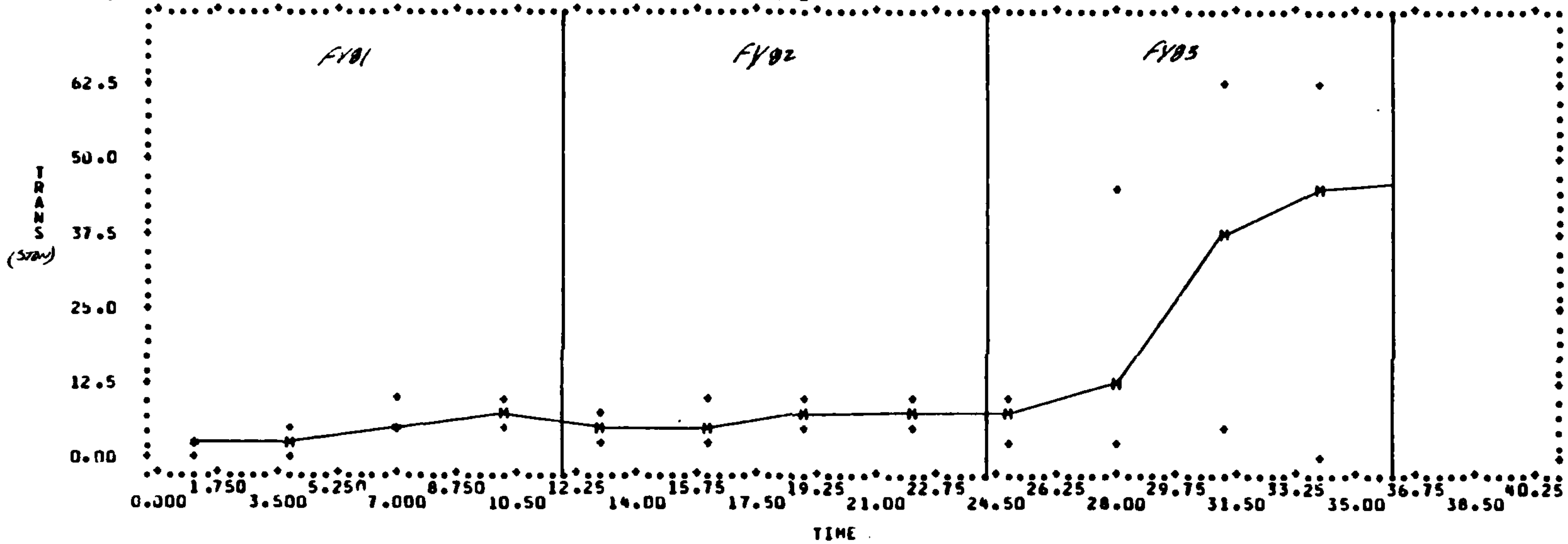
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.3050	.7710
4.000	6	.0000	.2891	.7710
7.000	6	.0815	.2548	.4755
10.000	6	.1105	.2315	.4425
13.000	6	.1105	.3686	1.2720
16.000	6	.1180	.3954	1.2720
19.000	6	.1255	.4242	.7905
22.000	6	.1520	.3771	.7905
25.000	6	.1520	.2276	.4065
28.000	6	.1630	.6492	2.4740
31.000	6	.2725	1.2669	2.4740
34.000	6	.0000	1.5793	2.6525

C		
0	284	613
1542	236	436
268	2544	366
951	676	545
163	752	683
525	[illegible]	4546
860	1581	4272
266	510	4262
353	1318	693
665	448	2656
253	364	4620
221	364	5305

Figure G-3. Three-month Moving Average Schematic
(Doven - Ramstein) (STON/month)
(page 2 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME

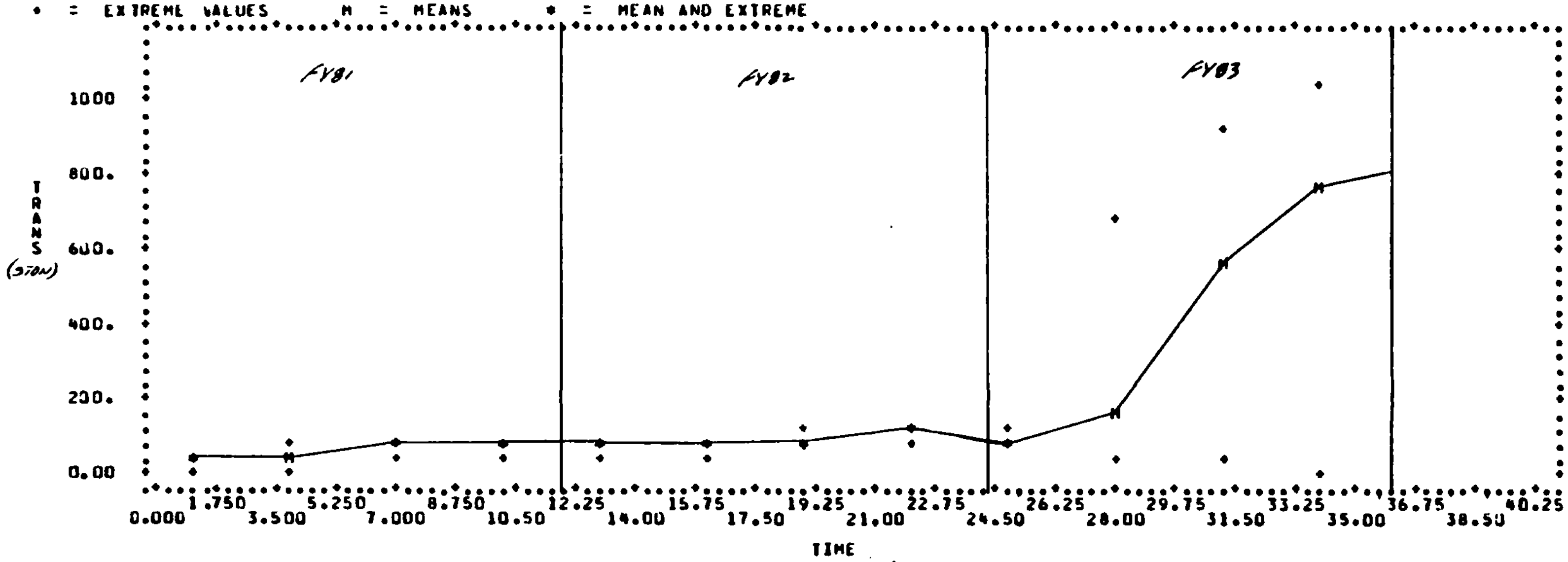


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	H		
1.000	3	.0585	1.4140	2.5805	117	11519	21211
4.000	6	.0585	2.9139	4.9590	5161	15655	7045
7.000	6	3.9655	6.0440	9.2000	3206	5346	8243
10.000	6	4.4265	6.6737	9.2000	7971	7611	11139
13.000	6	2.6980	5.5507	7.8275	9518	9688	23653
16.000	6	2.6980	5.7107	9.1295	6594	14259	91240
19.000	6	3.9055	6.4875	9.1295	12493	11195	69793
22.000	6	5.4455	6.7094	8.9330	18410	17666	103195
25.000	6	3.5225	6.2600	10.6055	15152	12631	126326
28.000	6	3.5225	13.5442	45.6200	15306	11273	120230
31.000	6	5.5695	37.1122	63.1630	9620	10651	114133
34.000	6	.0040	44.2062	63.1630	6653	10457	97019

Figure G-3. Three-month Moving Average Schematic
(Dover - Ramstein) (STON/month)
(page 3 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME

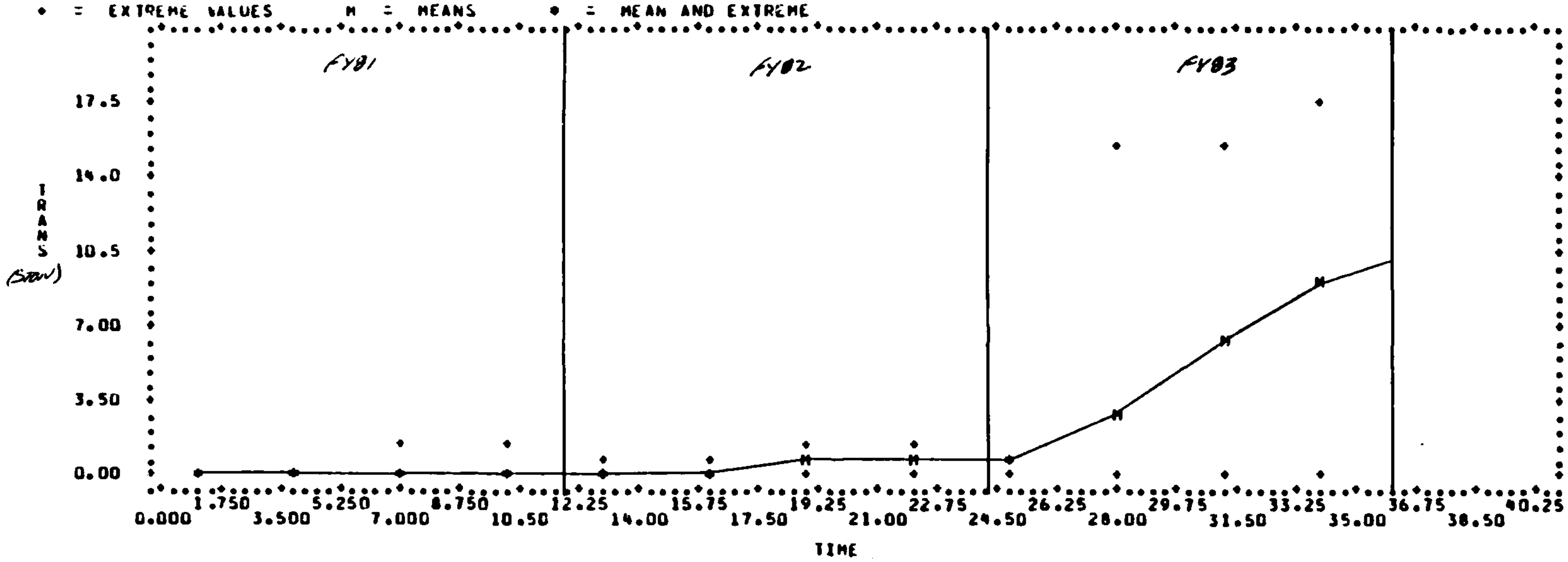


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	V		
1.000	3	.1625	35.4643	56.7910	325	115710	172667
4.000	6	.1625	52.0856	84.2395	113582	142137	133367
7.000	6	56.0315	69.4856	84.2395	98879	142030	132359
10.000	6	53.9135	64.8306	75.2975	112063	124635	135008
13.000	6	53.9135	63.0215	71.0685	131699	132543	104866
16.000	6	57.8550	68.0692	79.7875	168479	159575	1380356
19.000	6	62.4175	90.3356	134.1305	128244	193345	1856598
22.000	6	75.7020	102.8049	134.1305	142747	268261	1657061
25.000	6	66.1795	83.7665	120.4110	150595	205468	1741535
28.000	6	57.4330	171.6369	690.1780	107827	151404	1898466
31.000	6	52.4330	573.1853	929.2990	131172	174359	2055396
34.000	6	.0000	758.7543	1027.6980	117382	240672	1792462

Figure G-3. Three-month Moving Average Schematic
(Dover - Ramstein) (STON/month)
(page 4 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0000	.0000
4.000	6	.0000	.0053	.0320
7.000	6	.0000	.1961	1.1100
10.000	6	.0000	.1907	1.1100
13.000	6	.0000	.1522	.6355
16.000	6	.0000	.2469	.6355
19.000	6	.1140	.3989	1.5150
22.000	6	.0830	.5246	1.5150
25.000	6	.0830	.4845	.8515
28.000	6	.1445	2.9957	15.5750
31.000	6	.1445	6.4425	15.5750
34.000	6	.0000	8.9397	17.5370

2

0	[illegible]	1147
0	556	1703
0	1271	320
0	422	289
0	[illegible]	1339
[illegible]	[illegible]	31150
2220	[illegible]	3955
0	[illegible]	10193
[illegible]	[illegible]	[illegible]
0	[illegible]	[illegible]
0	[illegible]	27310
0	1173	35074

Figure G-3. Three-month Moving Average Schematic
(Dover - Ramstein) (STON/month)
(page 5 of 5 pages)

B	E	G	K
0	0	0	0
80	1350	80	109
927	53	1119	644
323	378	0	21
1130	21	1034	100
1613	57	298	1
1250	31	724	27
420	7	210	178
823	94	118	751
541	81	264	514
578	141	1099	71
1885	129	411	209
1258	415	6	190
618	111	488	475
409	50	63	1319
280	1330	6364	692
538	827	1013	282
494	137	13	1457
555	15	140	215
1119	5	7165	636
1540	0	28	380
1894	156	0	56
544	30	24	47
380	0	63	173
911	51	934	111
700	310	0	230
674	184	24	512
2079	150	112	323
937	280	170	591
2568	5297	9586	325
11031	1616	1700	1159
24575	122	2721	1915
16297	250	1045	4525
13875	314	0	3446
11453	387	0	2367
1496	3408	6361	5109

D	F	J	M
0	0	608	73
0	1	9734	6144
0	3	9657	3982
0	0	8807	3476
0	0	8209	4377
0	2	10229	1721
0	62	8052	1242
17	169	9019	6793
0	168	19256	6134
0	0	15946	6238
0	2	16641	3376
0	1	13454	4915
0	112	12415	4666
0	1504	10656	7398
0	166	13318	6626
0	49	12191	10867
0	37	12422	13798
0	6	10374	14573
0	1	11202	8193
0	7	10701	14903
0	120	11948	10840
0	36	15463	7909
0	68	14309	9332
0	0	18785	15711
0	0	18789	24127
0	517	13124	9959
0	1	12372	25106
0	0	12798	17607
0	0	9735	36403
0	904	115332	646962
0	0	135557	685596
0	6	141405	1045928
0	0	191207	485451
0	0	187656	576157
0	0	184104	666862
0	19	135500	572949

Figure G-4. Dover - Ramstein Cargo Distribution List (STON/month)
(page 1 of 3 pages)

N	Q	S	U	P	R	T	W
0	0	0	0	9	0	0	0
0	0	125	0	542	0	707	424
0	0	0	0	432	0	802	142
339	0	0	0	481	0	538	15
0	0	0	0	167	0	1064	58
0	0	45	0	395	0	178	3546
0	0	231	0	499	0	209	2101
0	0	47	0	648	0	107	1894
0	0	76	0	341	0	1815	236
0	0	2154	0	500	0	611	6207
0	0	56	0	529	106	1840	2005
0	0	637	0	1114	272	970	569
0	0	1588	0	771	245	199	1082
0	0	422	0	180	0	693	1700
0	0	146	0	245	0	71	0
0	0	383	0	336	0	1258	0
27	0	99	0	469	93	288	0
1	40	69	0	1142	0	261	369
0	0	0	0	543	246	168	0
0	0	47	0	1172	0	494	0
55	0	33	0	362	0	281	0
0	0	74	0	123	0	725	0
0	0	0	0	423	0	264	0
0	0	435	0	1047	0	648	0
0	0	961	0	735	0	967	0
5	0	241	0	106	0	0	0
0	0	20	0	561	0	1292	0
5	0	97	0	199	0	97	0
3	0	476	0	154	216	0	0
0	0	326	0	4124	0	5652	0
4	0	1158	0	975	0	8081	0
0	0	354	0	4011	0	4378	0
0	0	134	0	1175	0	2988	0
0	0	805	0	1312	0	3104	0
3	0	1476	0	1449	955	3220	0
0	0	1561	0	2565	0	9205	0

Figure G-4. Dover - Ramstein Cargo Distribution List (STON/month)
(page 2 of 3 pages)

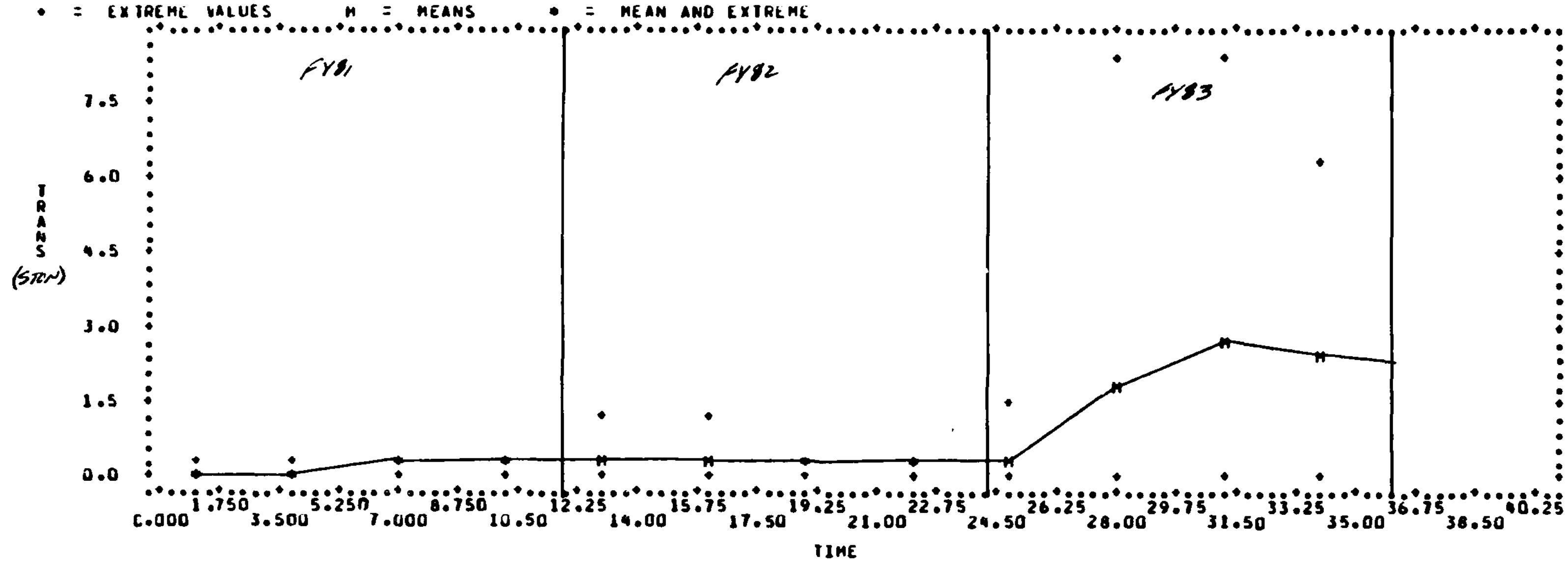
X	Z	3
0	0	0
0	0	0
16	0	0
97	0	0
72	0	0
71	0	0
12	11	0
0	0	0
0	0	0
0	0	0
245	0	0
0	0	0
0	352	0
0	0	134
627	0	0
0	9	0
0	0	0
619	0	3645
0	0	15
0	0	616
0	0	72
0	0	0
0	0	121
0	0	0
0	18	11
0	0	0
102	0	1152
0	0	148
0	0	1135
0	4200	0
0	0	0
0	0	0
0	0	353
0	0	10274
0	0	20194
0	0	28436

Y	1	4
0	0	0
0	0	0
83	0	0
69	0	0
84	0	0
159	41	0
69	0	0
56	0	0
77	0	0
11	0	0
3130	10	0
139	0	0
21	41	0
23	0	0
99	0	0
72	0	0
37	0	6
36	0	3718
140	0	0
126	0	3987
22	0	0
81	0	1367
40	0	182
107	0	0
146	0	0
144	0	0
107	0	47
253	0	18
112	0	0
702	0	105
260	0	0
1139	0	20606
259	0	0
507	0	0
754	0	285
760	0	376

Figure G-4. Dover - Ramstein Cargo Distribution List (STON/month)
(page 3 of 3 pages)

TRIMMING C CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



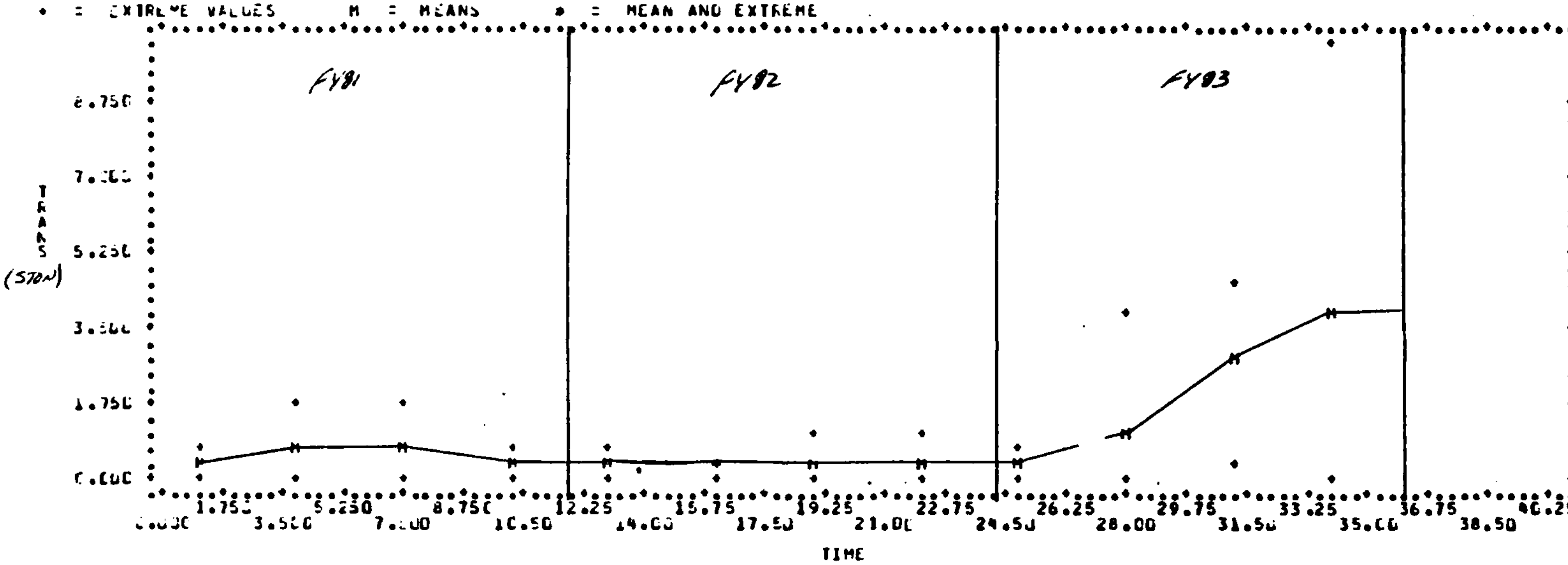
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0805	.1060	.1500
4.000	6	.0805	.1276	.2555
7.000	6	.0140	.1895	.3845
10.000	6	.0140	.2097	.3845
13.000	6	.0535	.3524	1.2615
16.000	6	.0365	.2966	1.2615
19.000	6	.0065	.1555	.3035
22.000	6	.0085	.1559	.3035
25.000	6	.0185	.3676	1.5140
28.000	6	.0550	1.7417	8.2625
31.000	6	.0550	2.6199	8.2625
34.000	6	.0000	2.5117	6.2315

A

175	2523	472
171	412	439
310	117	3026
162	276	327
511	176	11L
202	13	16525
582	212	5316
28	530	5336
769	607	125
471	17	1663
415	336	3200
211	119	17463

Figure G-5. Three-month Moving Average Schematics
(Dover - Dhahran) (STON/month)
(page 1 of 2 pages)

TRIMMING . CASES FROM 6. CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS # = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	[illegible]	.4265	.7685
4.000	6	[illegible]	.8552	1.658[illegible]
7.000	6	.0763	.7233	1.659[illegible]
10.000	6	.0760	.2974	.865[illegible]
13.000	6	[illegible]	.3493	.865[illegible]
16.000	6	[illegible]	.2477	.4[illegible]
19.000	6	[illegible]	.4772	1.1955
22.000	6	.0495	.4925	1.1955
25.000	6	[illegible]	.3[illegible]37	.57[illegible]
28.000	6	[illegible]	.9976	3.8[illegible]
31.000	6	[illegible]	2.77[illegible]8	4.6975
34.000	6	.1125	3.7[illegible]92	1[illegible]295

M		
0	667	1146
1537	330	762
1022	[illegible]	181
27[illegible]	612	1593
1591	501	687
331[illegible]	[illegible]9	7602
371	432	7472
1[illegible]2	23[illegible]1	6501
4[illegible]4	15[illegible]1	9395
3[illegible]6	[illegible]3	14727
17[illegible]	[illegible]	20059
4[illegible]6	1[illegible]75	1096

Figure G-5. Three-month Moving Average Schematics
(Dover - Dhahran) (STON/month)
(page 2 of 2 pages)

B	E	G	K
0	154	0	0
45	0	0	23
614	0	30	78
130	196	0	177
14	1228	0	238
140	135	0	228
5679	0	0	441
0	0	0	76
0	132	0	83
0	0	0	148
2362	0	0	3878
0	0	0	77
0	0	0	76
0	272	0	86
11	0	0	59
8	0	0	58
333	39	13	185
1553	0	0	133
0	0	0	709
0	0	0	59
17	0	0	615
0	0	0	205
0	0	0	112
0	0	0	166
75	58	0	169
0	0	0	289
0	0	0	1026
102	0	0	105
1335	0	0	216
0	474	0	2717
3800	0	0	15642
7810	0	68	1260
3225	0	0	903
3627	0	0	2833
804	30	0	4762
83	0	52	1759

C	F	J	M
0	0	175	0
144	0	1349	0
7544	0	829	0
0	5	757	0
0	0	664	0
22	0	2178	0
1	0	2757	0
0	0	1686	0
0	0	2289	0
9	0	3486	0
7	0	2388	0
0	0	2284	0
0	0	1676	0
0	0	1349	0
0	0	2113	0
0	0	2613	8
0	0	2063	0
677	0	953	0
161	0	1832	1
0	0	2554	0
0	0	1337	0
0	1	3536	0
0	0	1796	0
27	0	2153	0
0	0	1866	0
0	0	865	0
3	0	626	0
28	0	1735	20
1	0	1606	0
0	0	13592	0
125	0	13104	613
180	0	14398	0
26	0	13634	0
0	0	9027	0
0	0	4419	0
0	0	4452	43

Figure G-6. Dover - Dhahran Cargo Distribution List (STON/month)
(page 1 of 3 pages)

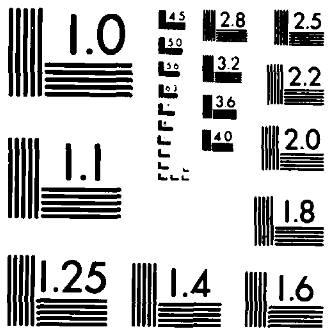
AD-A148 669 UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC) STUDY(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD J A SORENSON ET AL. SEP 84 CAA-SR-84-29

UNCLASSIFIED F/G 15/5 NL

END

FILMED

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

N	R	T	V
0	0	0	93
0	4273	6293	5429
0	4284	4190	869
0	6258	2196	282
0	5295	1476	447
0	4667	2675	1162
0	5492	4004	441
0	4975	4786	4478
0	4163	5260	165
0	8373	7773	2
0	4923	7977	571
0	3834	3435	24
0	11963	2105	0
0	7450	4529	450
0	7741	4275	7079
0	5230	2622	49
0	4557	3404	1
0	6000	4925	16
0	8793	4072	185
0	7934	2831	0
20	9428	7776	15
0	9604	5502	73
0	8820	4440	0
0	8786	2570	573
0	8984	3173	258
0	8475	1977	46
0	7696	1464	652
0	5095	3255	112
0	6771	2960	0
0	74490	21142	3
0	36683	16105	20
0	74865	32264	0
0	81435	93571	0
0	65594	54724	0
0	49753	15877	2078
0	119900	18857	0

P	S	U	W
0	0	0	0
11	363	0	16
0	198	0	27690
0	291	0	50
0	252	0	0
0	0	0	0
3	33	0	30
0	28	0	0
0	38	0	9
0	55	0	0
0	469	0	104
0	0	0	10
0	11	0	143
1	1035	0	0
0	83	0	0
0	505	0	0
27	14	0	0
6	0	0	0
0	14	0	0
0	187	0	0
0	0	0	0
0	22	0	0
0	0	0	0
0	0	0	0
0	0	644	0
0	68	0	0
0	44	3100	0
0	0	0	0
0	0	0	0
0	0	109230	0
0	4794	113825	0
0	620	106906	0
0	8183	109083	0
0	5197	91996	0
0	2019	74099	0
0	15	31761	0

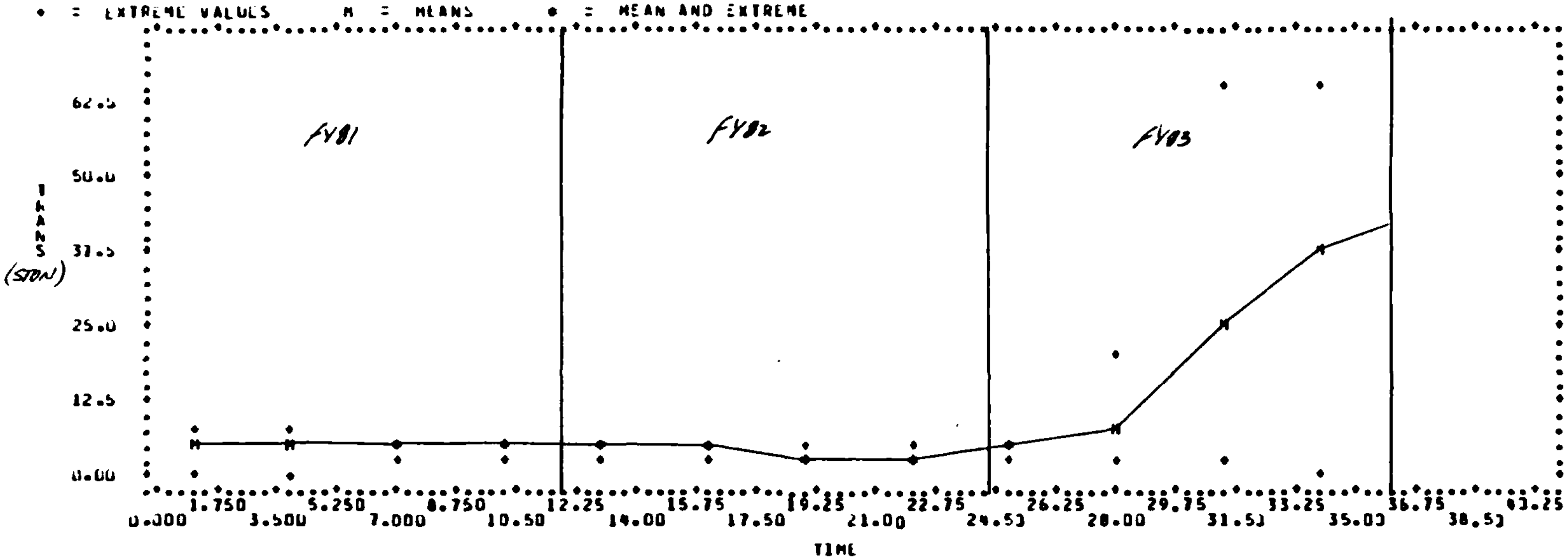
Figure G-6. Dover - Dhahran Cargo Distribution List (STON/month) (page 2 of 3 pages)

X	2	4
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
25	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	22	0
0	11	0
0	0	0
0	11	0
0	0	32
0	0	0
0	0	570
0	0	0
0	0	0
0	0	0
0	0	0
0	10	0
0	0	0
0	10	0
0	5	0
0	10	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	45
0	0	0

Y	3
0	0
632	0
395	0
1200	0
698	0
2055	0
620	0
1371	0
1258	0
720	0
1736	0
2306	0
427	0
1123	0
897	0
507	0
947	0
1235	0
1497	454
1996	0
1036	0
1343	0
469	0
997	0
1445	291
111	0
1122	0
736	0
424	0
13707	0
13764	0
20451	0
10440	0
0	0
8196	0
9017	0

Figure G-6. Dover - Dhahran Cargo Distribution List (STON/month) (page 3 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES   M = MEANS   ◆ = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	4.3677	7.1920
4.000	6	.0000	4.2667	7.1920
7.000	6	2.9000	3.8069	4.8345
10.000	6	2.9000	4.4665	5.9735
13.000	6	2.7990	4.6694	5.9735
16.000	6	2.7990	3.7966	5.5145
19.000	6	3.2480	3.6740	4.0780
22.000	6	2.8610	3.5967	4.2650
25.000	6	2.7775	4.0286	5.7890
28.000	6	2.5750	6.6912	19.5095
31.000	6	2.5790	25.9264	64.4655
34.000	6	.2500	36.3622	64.8995

V

0	11025	9462
14384	6257	11578
11622	5598	5555
7384	7036	9523
9669	7486	5158
7541	8156	39319
7772	6496	66176
5810	7981	62270
7117	6933	128971
9979	5762	129385
11223	8570	129799
11947	7419	48630

Figure G-7. Three-month Moving Average Schematic (Dover - Incirlik) (STON/month)

A	C	F	H
5	0	0	0
4	0	0	31
2	24	0	92
4	7	0	60
6	0	0	34
2	0	0	345
0	1	107	333
2	24	0	405
70	2	0	6608
533	97	0	5025
448	4	0	2410
3	0	0	331
1	0	0	32
4	270	0	86
0	1	0	6
193	0	0	154
0	0	0	722
0	5	0	422
0	0	0	30
0	2	0	150
100	0	0	1974
8	0	0	741
10	0	0	279
1464	6	0	718
52	0	0	345
5	0	0	62
0	0	0	130
514	10	0	216
72	0	0	278
81	575	0	5829
24	0	0	5089
1562	14	0	9803
24	0	0	984
61	0	0	2729
103	0	0	4475
119	0	0	8577

B	E	G	J
0	0	0	33
211	11	1	1160
1458	5	15	720
[illegible]	0	0	626
0	0	0	722
5206	3	1	752
3	0	0	1103
44	0	20	940
417	24	0	1401
22	0	2	1628
128	0	0	682
4	0	0	933
340	227	28	531
0	0	1	679
930	0	0	1074
9	0	0	595
51	0	0	540
72	0	61	1345
2	0	19	1062
0	0	2	1435
0	0	53	1384
45	0	0	1527
533	43	1	786
2	12	0	1014
194	3	0	993
118	0	26	749
42	0	0	1451
281	0	0	682
593	0	1	1034
0	3226	0	11036
3212	33	21	8967
500	0	0	17367
127	55	0	19247
324	0	0	17795
522	0	9	16344
6052	0	438	14472

Figure G-8. Dover to Incirlik Cargo Distribution List (STON/month) (page 1 of 3 pages)

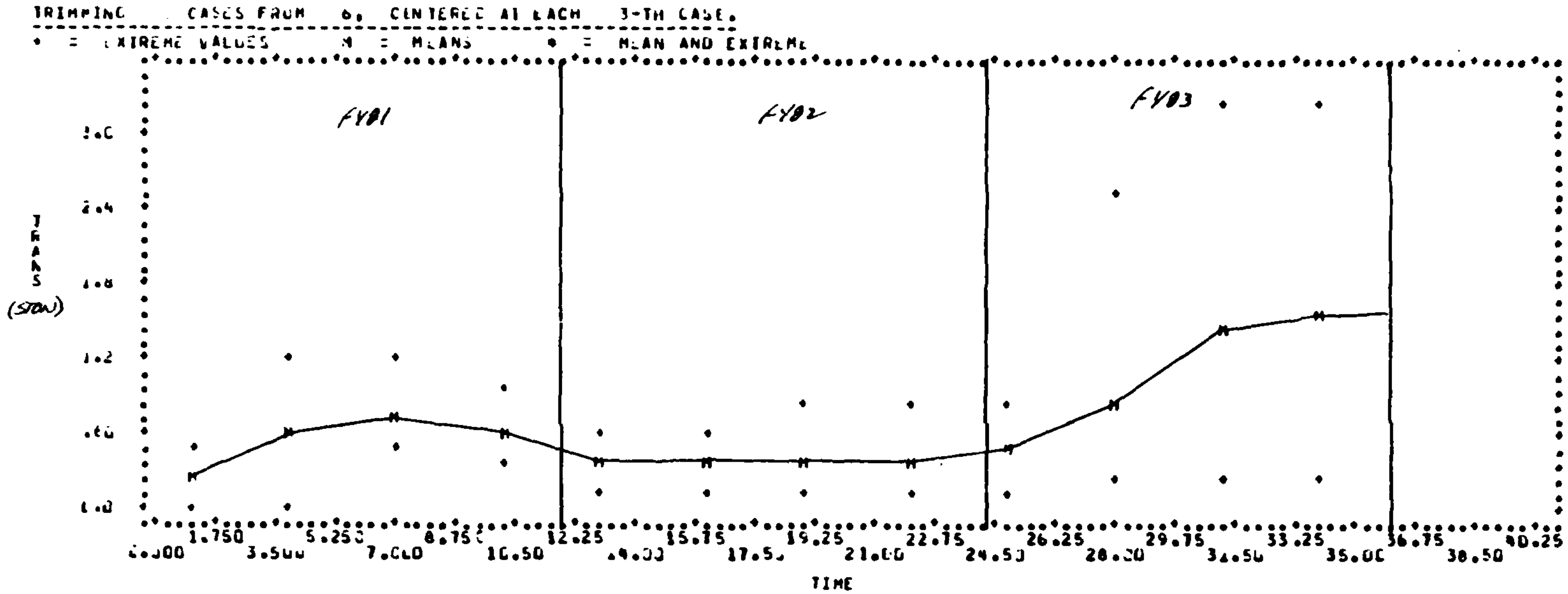
K	N	R	T
0	0	0	0
369	0	0	0
336	0	0	316
977	0	0	0
1113	0	324	0
300	0	0	0
568	0	0	0
540	0	0	0
356	0	0	68
598	0	0	0
400	0	0	1504
449	1	0	0
512	0	0	0
466	0	0	0
88	0	0	79
204	0	0	0
450	0	0	0
358	0	0	0
350	0	0	750
600	0	0	0
527	0	0	0
686	0	0	401
556	0	0	0
1493	0	0	0
561	0	0	0
445	0	0	0
960	0	0	251
359	0	0	0
713	0	0	67
6474	0	0	0
8926	0	0	0
3929	0	0	6472
3834	0	0	0
4769	0	0	0
5705	0	0	1659
9348	0	0	1015

M	P	S	U
0	0	0	0
1	4	0	0
19	4	93	0
0	0	687	0
0	100	0	0
0	4	0	0
19	10	106	0
0	0	0	0
0	2	0	0
0	29	17	0
87	16	0	0
0	41	0	0
0	301	30	0
0	21	333	0
0	0	32	0
0	3	1	0
125	49	64	0
0	49	0	0
0	20	0	0
46	14	0	0
0	7	0	0
0	0	0	0
1	10	0	0
1	0	0	0
0	2	0	600
3	0	0	0
3	0	28	0
2	0	0	0
6	59	0	0
37	0	0	34488
0	1354	48	38650
0	0	608	36552
7	7	0	36097
0	0	0	61703
0	30	0	87310
0	170	97	73092

Figure G-8. Dover to Incirlik Cargo Distribution List (STON/month)
(page 2 of 3 pages)

1	2	3	4
0	0	0	0
0	0	614	0
0	0	503	0
0	0	1291	0
0	0	1426	0
0	0	2661	0
0	0	1606	0
2803	0	1318	0
0	6	1787	0
0	0	1105	0
0	0	1916	0
0	0	1572	0
0	4	1019	0
0	0	953	0
0	0	1964	0
0	0	1237	0
0	0	848	0
0	574	2530	0
0	0	1449	0
0	0	1313	0
0	0	3766	1963
0	0	1297	0
0	0	2069	0
0	0	1182	0
0	0	262	0
0	0	1223	0
0	0	131	0
0	0	380	0
0	0	552	0
0	0	7504	0
0	0	4750	0
0	0	3649	0
0	0	2789	0
0	0	4921	0
0	0	7053	0
0	0	6780	0

Figure G-8. Dover to Incirlik Cargo Distribution List (STON/month) (page 3 of 3 pages)

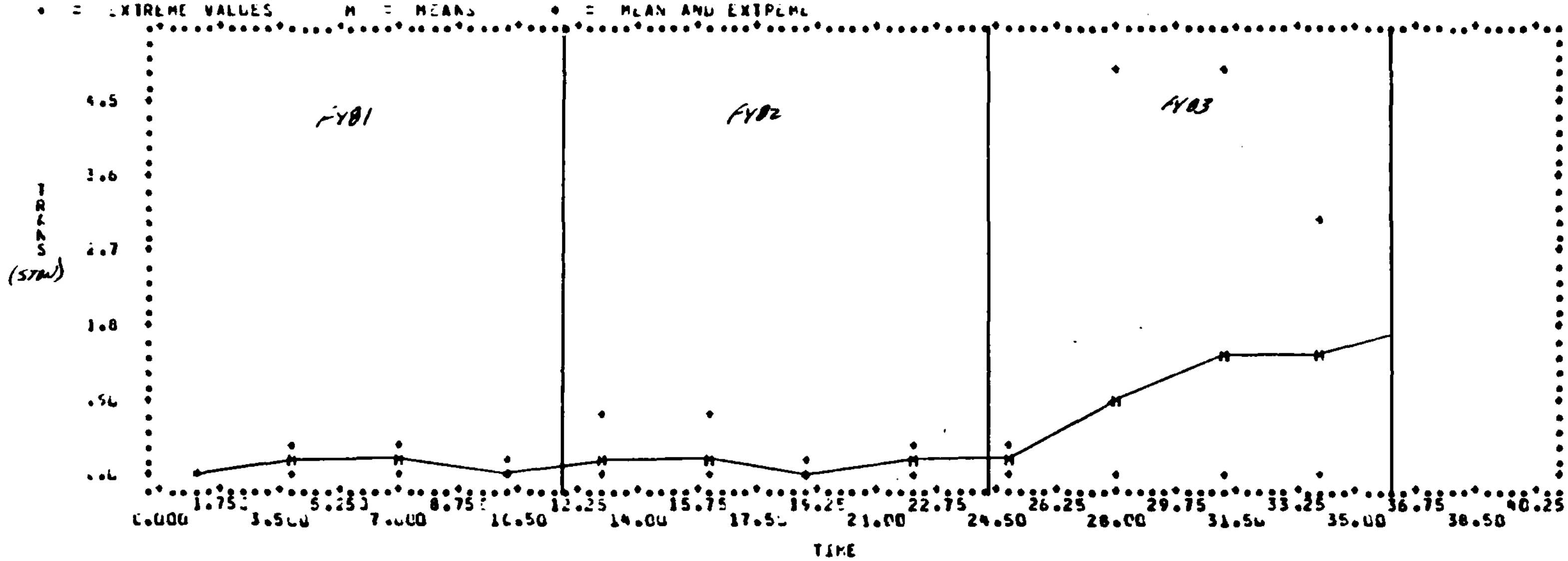


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	A		
1.000	3	.0415	.2755	.5030	53	416	1767
4.000	6	.0415	.5770	1.2285	1016	214	1186
7.000	6	.4225	.7791	1.2285	514	777	624
10.000	6	.3145	.5752	1.0040	2417	1061	451
13.000	6	.1325	.3559	.6390	1416	600	654
16.000	6	.1323	.3338	.5475	1416	678	5130
19.000	6	.1660	.4161	.8690	2018	532	794
22.000	6	.1655	.3459	.8690	1225	1178	3366
25.000	6	.1655	.4412	.8835	645	314	6510
28.000	6	[illegible]	.8477	2.5655	629	376	4699
31.000	6	.2255	1.4087	3.2555	917	331	3289
34.000	6	.2940	1.5131	3.2550	1278	1010	3610

Figure G-9 Three-month Moving Average Schematic
(Charleston to Howard) (STON/month)
(page 1 of 5 pages)

TRIMMING . CASES FROM . CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME

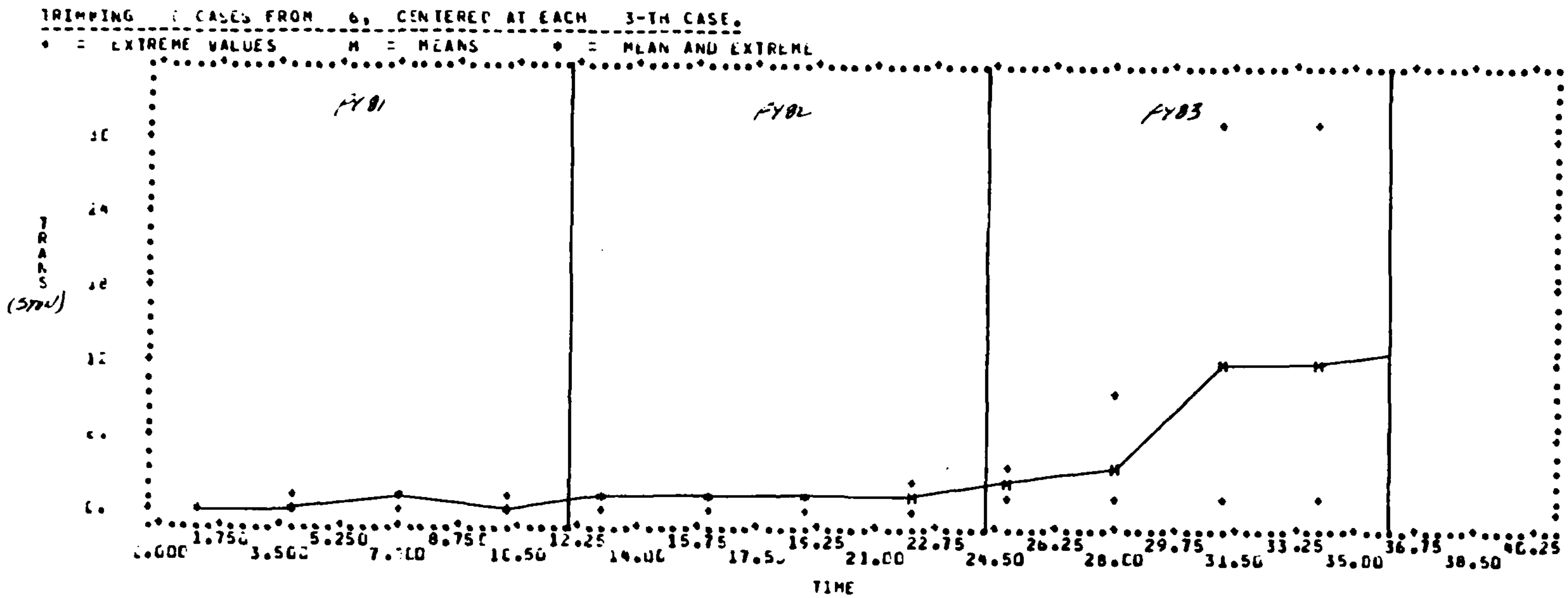


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.[illegible]125	.2328	.[illegible]455
4.000	6	.[illegible]125	.1[illegible]14	.4155
7.000	6	.[illegible]	.1349	.4155
10.000	6	.[illegible]	.0753	.144[illegible]
13.000	6	.[illegible]	.1566	.6625
16.000	6	.[illegible]	.1436	.6625
19.000	6	.[illegible]25	.[illegible]341	.[illegible]995
22.000	6	.01[illegible]	.1334	.3995
25.000	6	.[illegible]	.1218	.3985
28.000	6	.[illegible]	.8[illegible]41	4.8975
31.000	6	.[illegible]	1.3875	4.8975
34.000	6	.[illegible]	1.5[illegible]64	3.1295

C

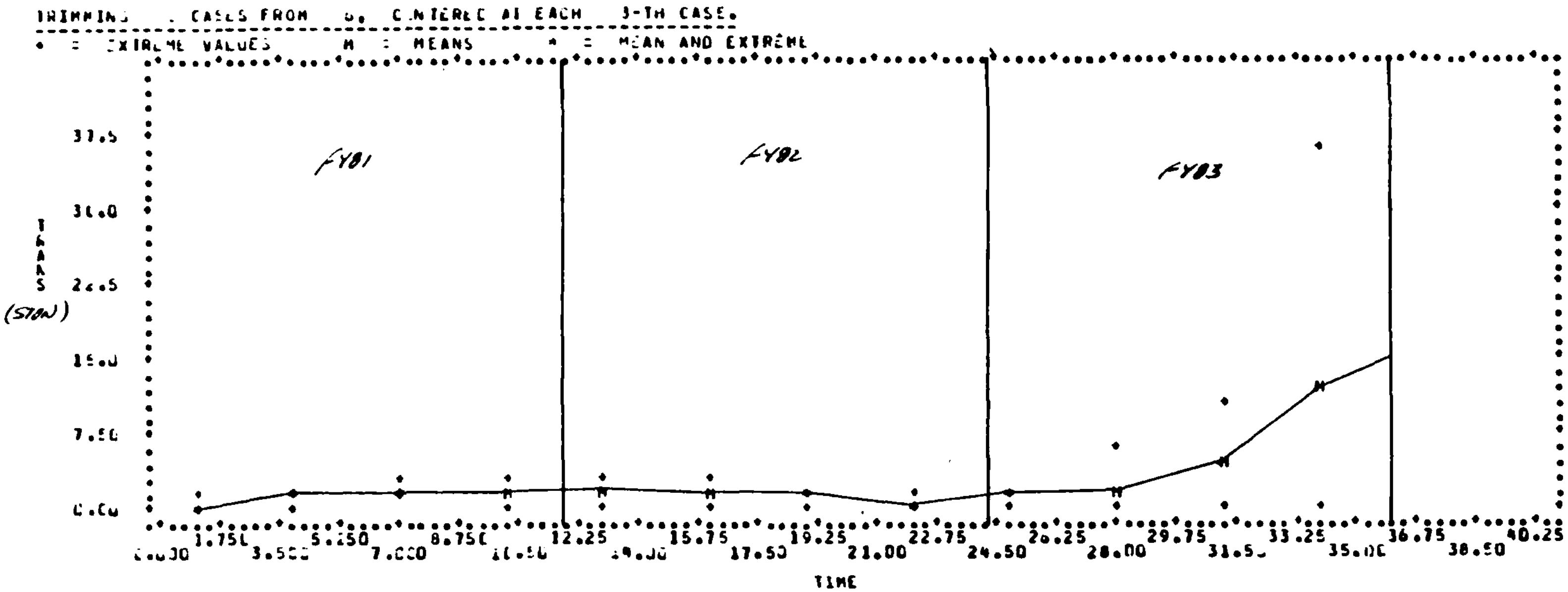
25	1365	124
51	224	11
81	9	10
135	11	299
[illegible]4	5	10
[illegible]31	11[illegible]	9795
127	[illegible]9	3305
[illegible]8	159	2067
1[illegible]4	[illegible]6	1174
1[illegible]	[illegible]21	3223
0	[illegible]9	5272
145	7[illegible]7	6259

Figure G-9 Three-month Moving Average Schematic
(Charleston to Howard) (STON/month)
(page 2 of 5 pages)



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	H		
1.000	3	.0330	.1648	.2930	46	1597	9276
4.000	6	[illegible]	.5218	1.5005	586	941	7011
7.000	6	.1663	.6332	1.5005	337	2216	3653
10.000	6	[illegible]	.4809	.6430	7001	1216	3543
13.000	6	.4905	.7199	[illegible]	1112	1524	2459
16.000	6	[illegible]	.7506	[illegible]	1160	423	19162
19.000	6	.3115	.6067	[illegible]	336	2078	36722
22.000	6	.3255	.9314	[illegible]	1075	651	63186
25.000	6	.6615	[illegible]	3.5555	955	1698	14246
28.000	6	1.2295	3.3587	9.581[illegible]	1175	1323	19072
31.000	6	1.2255	11.7767	31.591[illegible]	1276	1567	23896
34.000	6	1.1260	12.5152	31.5930	964	3030	7679

Figure G-9 Three-month Moving Average Schematic
(Charleston to Howard) (STON/month)
(page 3 of 5 pages)



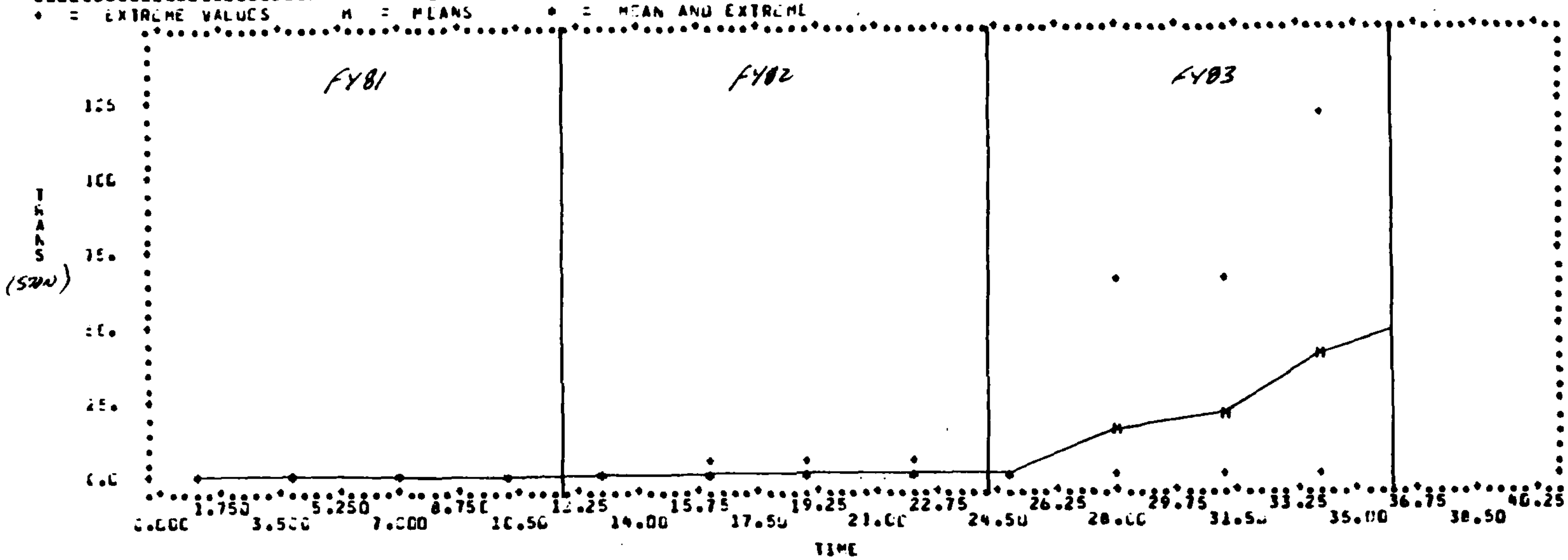
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.1125	.6338	1.1250
4.000	6	.2175	1.0420	2.0273
7.000	6	.8275	1.6435	2.4593
10.000	6	.7430	1.4544	2.4593
13.000	6	.7325	1.1697	2.3045
16.000	6	.6725	1.3011	2.3045
19.000	6	.4515	.9654	1.9775
22.000	6	.4915	.7422	.9370
25.000	6	.3770	.6217	1.3635
28.000	6	.2755	1.4495	5.3110
31.000	6	.2755	4.0072	10.0430
34.000	6	.1765	11.8715	35.8110

M		
25	1670	780
2250	1445	1144
1528	4019	2727
3006	1345	1202
1141	2013	559
4054	3941	10622
4918	1319	20086
3271	1414	6966
2632	983	6632
1486	1772	41407
2231	1634	34775
2635	1604	71622

Figure G-9 Three-month Moving Average Schematic
(Charleston to Howard) (STON/month)
(page 4 of 5 pages)

TRIMMING [illegible] CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0535	.4533	.8593
4.000	6	.[illegible]535	.7555	1.3273
7.000	6	.2865	.9320	1.3273
10.000	6	.[illegible]65	.9[illegible]	1.9435
13.000	6	.3375	.9716	1.9435
16.000	6	.7[illegible]0	1.3655	2.9475
19.000	6	.7[illegible]5	2.1837	3.4485
22.000	6	1.2610	1.9466	3.4485
25.000	6	1.2610	1.5517	2.2[illegible]3[illegible]
28.000	6	1.[illegible]	12.9061	64.66[illegible]
31.000	6	1.4735	21.2682	64.66[illegible]
34.000	6	[illegible]	37.7412	119.6155

V

1[illegible]7	2546	2717
1718	1410	3248
6[illegible]5	1598	4436
16[illegible]2	1425	2941
2014	5895	12461
18[illegible]0	3732	129320
11[illegible]4	2479	51166
2381	[illegible]7	35635
573	[illegible]41	23194
661	2511	63422
1540	2536	103650
3687	2748	232231

Figure G-9 Three-month Moving Average Schematic
(Charleston to Howard) (STON/month)
(page 5 of 5 pages)

E	E	C	H
2	0	0	10
1018	340	229	808
674	666	28	655
2802	298	8	601
1098	123	114	1279
1910	285	267	513
676	89	605	2013
2516	0	226	2020
111	201	13	1343
580	792	289	1362
143	17	78	1753
578	50	71	1012
76	216	189	851
383	45	95	1652
983	150	224	1554
70	0	210	687
240	344	61	1724
529	615	297	1773
984	89	156	1826
329	1144	116	1808
1892	193	266	1865
264	23	530	1492
2700	418	740	1953
1575	705	131	1457
350	158	52	1690
1309	0	227	987
1625	154	85	1048
581	32	36	1402
2639	9	163	1218
8005	27	2017	21602
47007	619	3463	19955
6978	170	4128	16230
1376	4529	1996	17519
4803	0	1310	14837
8226	147	485	12095
12928	3193	3267	16386

C	F	J	K
0	0	41	0
0	39	2776	0
0	0	2346	0
0	1	2413	0
0	0	2581	0
0	84	3634	0
0	104	3758	0
0	100	5053	0
0	21	6716	146
0	0	9006	0
17	247	6000	0
0	128	5263	0
0	1	5314	0
0	0	3131	0
0	270	3860	0
0	0	4577	0
0	50	3045	0
0	8	3052	26
0	637	3781	0
0	61	3562	416
64	130	5230	0
0	111	4570	0
0	636	5037	0
0	10	5643	0
0	746	5510	0
0	1008	3805	0
0	650	4983	0
0	0	4939	0
0	0	4036	0
160	14	46247	0
0	1379	45066	0
0	48	37999	0
0	0	58229	0
0	0	539	0
0	[illegible]	75476	33
0	0	61679	0

Figure G-10. Charleston to Howard Cargo Distribution List (STON/month)
(page 1 of 3 pages)

P	R	T	W
14	0	249	0
71	0	2863	918
42	0	233	210
0	6539	410	77
206	182	54	4736
86	0	126	1523
98	0	0	92
25	0	0	669
458	0	0	209
28	595	441	182
9	395	17	136
2	0	542	3487
53	0	0	1665
21	16	48	43
3	0	339	6
219	368	148	0
89	0	392	0
96	0	0	0
74	3704	0	0
449	2904	0	0
143	1088	0	0
167	160	544	0
237	3	831	0
99	216	728	0
36	0	735	0
93	4	563	0
34	0	0	0
8	186	670	0
375	1397	0	0
13287	0	0	0
3542	520	0	0
884	0	15272	0
2215	0	11700	0
1287	0	15418	0
359	705	19136	0
2299	3075		0

Q	S	U	X
0	34	0	0
0	793	0	0
0	896	0	0
0	11	0	0
0	109	0	0
0	18	0	0
0	159	0	0
0	199	0	0
0	323	0	0
0	200	0	0
0	414	0	0
0	449	0	0
0	1173	0	18
0	343	0	0
0	541	0	0
0	106	0	0
0	61	0	0
0	1396	0	0
0	345	0	0
0	234	0	0
0	1464	0	0
0	147	0	0
0	313	0	0
0	611	0	0
0	5778	0	0
0	360	0	0
0	272	0	0
0	165	0	0
0	332	0	0
0	174	4415	0
0	4651	5747	0
0	1409	4940	0
0	445	4255	0
0	2042	0	0
0	3639	6317	0
0	12966	5578	0

Figure G-10. Charleston to Howard Cargo Distribution List (STON/month) (page 2 of 3 pages)

Y	2	4
39	0	0
2038	0	0
1660	0	0
1128	0	0
1311	0	0
1815	0	0
1564	0	0
1172	0	0
697	0	0
1177	0	0
1416	0	0
2483	0	0
1252	0	0
1207	46	0
1721	78	61
863	0	0
913	0	0
1589	13	42
2008	34	0
1752	233	0
1617	77	9
1903	119	11
1997	198	0
2307	47	23
1936	0	566
942	825	1145
1074	378	0
1367	0	1670
1671	3	1200
12206	2655	18
30933	254	140
18131	978	70
17874	14346	3010
10	0	0
28464	34	902
31470	322	11434

2	3
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
2	0
0	0
3	306
0	21
0	0
0	375
0	67
0	455
0	156
0	0
0	0
0	87
0	9171
0	312
0	7100
0	0
0	3244
0	0
0	2560
0	3216
0	7670
0	326
0	5430
0	10535
0	17132

Figure G-10. Charleston to Howard Cargo Distribution List (STON/month) (page 3 of 3 pages)

B	E	G	H
0	0	0	0
0	876	0	0
9	10	0	232
4	25	0	11
74	66	0	10
1056	890	0	155
1137	45	0	47
291	244	190	11
324	636	0	14
1351	247	441	1267
21	203	705	822
29	81	55	11
87	68	0	1730
171	147	42	145
165	492	0	671
183	511	224	16
514	1920	0	8
0	3168	0	77
143	1896	0	547
117	1496	0	594
24	1601	0	108
44	1482	0	132
242	651	269	1586
337	658	0	90
206	153	0	30
151	707	153	0
66	590	0	71
268	345	296	459
382	153	0	0
7321	24788	0	1740
672	9188	2736	0
334	3423	0	0
344	7	0	0
1124	642	0	0
1903	931	0	0
10070	71	0	1959

C	F	J	K
0	0	183	0
0	0	3445	0
0	0	2667	0
0	10	4682	0
0	0	3124	0
0	0	3945	0
0	5	3097	0
0	16	3306	3
0	3	6824	0
0	0	8100	14
0	18	6090	1
0	0	4667	3
0	5	4349	0
52	0	3285	0
0	261	3889	0
0	25	4160	4
17	43	3450	3
0	347	3726	0
0	0	3874	0
0	0	3604	0
0	0	6330	0
0	955	7054	0
0	0	6285	170
0	0	6021	0
0	0	4615	22
0	0	4381	0
0	214	5360	474
0	0	5175	0
0	5	5312	0
0	0	48193	0
0	0	50029	0
0	1350	54246	4
0	0	82984	0
0	0	81825	663
0	0	80666	0
0	1750	58657	

Figure G-11. Travis to Hickam Cargo Distribution List (STON/month) (page 1 of 3 pages)

P	S	U	X
0	0	0	0
0	0	0	0
224	794	0	0
13	0	0	0
0	0	0	0
34	276	0	0
11	656	0	0
83	13	0	0
10	0	0	0
30	0	0	0
93	0	0	0
7	14	0	0
11	0	0	0
16	142	0	0
7	0	0	0
33	0	0	0
46	2	0	0
36	8	0	0
25	0	0	0
17	0	0	0
0	0	0	0
3	0	0	0
30	0	0	0
0	21	0	0
10	0	0	0
0	8	0	0
0	6	0	0
2	0	0	0
1	0	0	0
0	9	0	0
3052	0	0	627
2364	580	0	0
0	288	0	0
0	182	0	0
2	76	0	0
0	106	0	0

F	T	W	Y
0	0	0	0
0	0	2465	12
0	0	4929	0
0	396	0	134
0	0	154	134
0	0	7527	0
0	0	2745	13
0	0	477	8
0	148	2392	261
0	336	5323	111
0	0	2406	44
0	179	101	0
0	0	2397	434
0	0	89	464
0	0	0	44
0	0	0	89
0	0	0	0
0	58	0	78
0	0	0	89
0	0	0	0
0	752	0	112
0	2413	0	0
0	1474	0	258
0	152	0	170
0	0	0	92
0	319	0	0
0	0	0	680
0	0	0	89
0	87	0	264
0	762	0	1629
0	0	0	0
0	0	0	1350
0	2433	0	1240
0	0	0	0
0	1614	0	0
0	0	0	1232

Figure G-11. Travis to Hickam Cargo Distribution List (STON/month)
(page 2 of 3 pages)

2	3
0	0
55	0
0	0
0	0
0	0
0	0
7	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	168
0	3
0	5
0	1
0	10
0	8
3	0
0	0
0	0
0	0
0	1
0	0
0	0
0	298
0	0
0	0
0	0
0	0
0	599
0	0

2	4
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
2392	2
0	0
0	0
0	176
54	470
185	21
0	0
0	557
283	0
0	0
38	66
19	2
26	0
31	4
14	3
1750	0
1574	0
23050	149
0	0
0	0
368	24358
0	15157

Figure G-11. Travis to Hickam Cargo Distribution List (STON/month)
(page 3 of 3 pages)

E	F	J	M
0	0	0	0
284	0	12	8
16	0	263	0
0	124	708	5
0	0	389	10
0	3	0	23
0	0	0	4
0	30	0	6
0	0	0	0
0	1	40	775
0	2	200	0
0	32	38	108
0	4	8	16
0	5	0	112
286	0	0	0
0	0	114	3
0	0	510	0
0	5	0	0
0	0	80	0
0	7	23	6
0	4	26	1
0	2	0	0
4	2	58	630
0	0	34	0
0	10	10	5
0	0	18	1080
0	2	0	0
1	29	0	2
67	0	0	0
0	0	1172	1242
0	1064	0	246
0	0	0	145
0	0	0	0
0	0	0	0
3	0	838	0
230	0	605	0

C	G	K	P
0	0	0	0
0	37	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	49	0
0	0	0	0
0	0	0	3
85	0	0	0
48	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	24	0
0	0	0	0
0	0	0	0
87	0	0	0
0	0	0	0
1	0	0	0
0	0	0	0
0	0	0	0
0	0	4	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
219	0	0	75
0	0	0	0

Figure G-12. Travis to Clark Cargo Distribution List (STON/month)
(page 1 of 2 pages)

S	U	Y	2
0	0	0	0
0	0	0	0
0	0	0	0
0	0	22	0
0	0	0	0
0	0	601	0
0	0	0	0
0	0	89	0
0	0	123	0
0	0	0	0
0	0	123	0
0	0	0	0
2	0	72	0
0	0	0	0
0	0	64	0
0	0	145	0
0	0	0	0
88	0	100	0
0	0	67	0
0	0	0	5013
0	0	56	0
0	0	0	0
0	0	56	0
0	0	11	0
0	0	77	0
0	0	0	0
0	0	87	0
0	0	44	0
0	0	0	0
0	0	720	0
1230	0	0	0
0	0	0	0
2066	0	596	0
0	400	0	0
1777	0	0	0
997	0	254	0

T	W	Z	3
0	0	0	0
0	0	0	0
0	0	0	0
0	4	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
365	0	0	0
0	27	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
79	0	0	0
0	0	0	0
0	0	0	0
114	0	0	0
0	0	0	0
0	0	47	0
0	0	0	0
0	0	0	0
58	0	0	0
0	0	0	0
0	0	0	0
0	0	0	12
0	0	0	0
0	0	0	0
0	0	0	0
0	0	500	0
0	0	0	0
0	0	450	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	350	0

Figure G-12. Travis to Clark Cargo Distribution List (STON/month)
(page 2 of 2 pages)

A	C	H	K
0	0	0	0
6	0	16	0
22	0	53	0
0	0	6	0
0	0	167	0
2	0	75	0
42	0	0	0
0	0	103	0
16	0	0	0
24	0	21	0
2575	0	0	0
32	0	0	0
0	0	7	0
27	0	0	0
257	0	0	26
12	0	5	0
0	2	0	0
17	0	0	0
17	0	0	0
0	0	0	0
10	0	4	25
0	0	77	0
0	0	22	0
0	0	22	4
0	16	0	0
0	0	23	0
0	0	0	0
0	0	37	0
0	0	0	0
0	0	204	0
0	0	287	0
0	0	484	0
0	0	64	0
0	0	1079	0
367	0	2175	0
0	0	76	0

F	G	J	M
0	0	0	0
0	49	37	0
3	0	17	12
4	0	16	0
0	0	50	0
0	0	0	8
0	12	62	0
0	0	85	0
0	0	149	0
0	0	103	0
0	0	100	0
0	0	82	2
0	0	256	0
0	0	8	21
10	0	93	0
0	0	178	0
0	250	206	0
0	0	102	0
0	0	202	0
0	37	159	0
0	0	246	0
0	0	451	0
0	0	67	0
0	0	222	0
0	0	153	0
0	0	213	0
0	0	101	0
0	0	167	0
0	0	307	0
0	0	1444	0
0	120	2761	0
0	0	1472	0
0	0	3188	0
0	0	2467	0
0	0	1745	0
0	0	1467	0

Figure G-13. Travis to Guam Cargo Distribution List (STON/month)
(page 1 of 2 pages)

R	U	W	Y	T	V	Z	Z
0	0	0	0	0	0	0	0
0	0	0	34	0	0	4	0
0	0	0	0	0	0	0	0
0	0	173	33	0	136	0	0
0	0	0	0	0	0	0	0
0	0	0	27	0	0	0	0
3	0	0	0	0	46	0	0
0	0	0	44	0	0	0	0
0	0	0	27	0	0	0	0
0	0	0	77	0	0	55	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	6	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	56	0	3	0	0
0	0	0	0	0	0	0	27
0	0	0	45	0	0	0	0
0	0	0	22	47	0	0	0
0	0	0	0	518	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	6	0	0	0	0
0	0	0	11	0	15	50	0
0	0	0	30	0	0	0	0
0	0	0	11	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	11	0	0	5	0
0	0	0	11	0	0	0	0
0	0	0	0	0	0	150	0
0	0	0	448	0	0	500	0
0	0	0	0	0	0	500	0
0	0	0	0	0	0	0	0
0	0	0	596	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	336	0	0	0	0

Figure G-13. Travis to Guam Cargo Distribution List (STON/month)
(page 2 of 2 pages)

A	C	H	K
0	0	0	0
164	3	0	0
22	0	2	0
3	0	0	0
0	0	0	0
216	0	0	0
93	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	0	0	1
0	0	0	0
12	14	15	4
8	0	0	0
22	0	0	5
0	0	0	0
45	0	0	0
37	0	0	0
8	0	0	0
0	0	0	0
0	0	0	0
116	0	0	0
0	0	0	0
8	0	0	0
24	0	0	10
9	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	406	32	5384
0	0	0	44
0	0	120	0
0	0	0	0
0	0	0	0
1124	0	0	0
617	0	0	0

E	G	J	N
0	0	0	0
0	0	137	0
19	5	0	0
0	0	0	0
0	0	0	0
0	0	0	224
0	0	0	0
8	0	0	12
0	0	0	0
1	0	194	0
0	0	48	0
0	0	0	0
1	0	0	0
0	0	149	0
0	0	36	0
0	0	42	0
0	0	0	0
0	0	70	17
0	0	0	12
0	0	9	0
0	0	0	0
0	0	76	0
0	0	93	10
0	0	55	0
11	0	107	0
0	0	0	0
0	0	0	0
0	0	34	0
0	0	0	0
32	0	0	0
0	0	260	0
0	0	453	0
0	0	496	0
0	0	903	0
0	0	1310	0
0	0	680	0

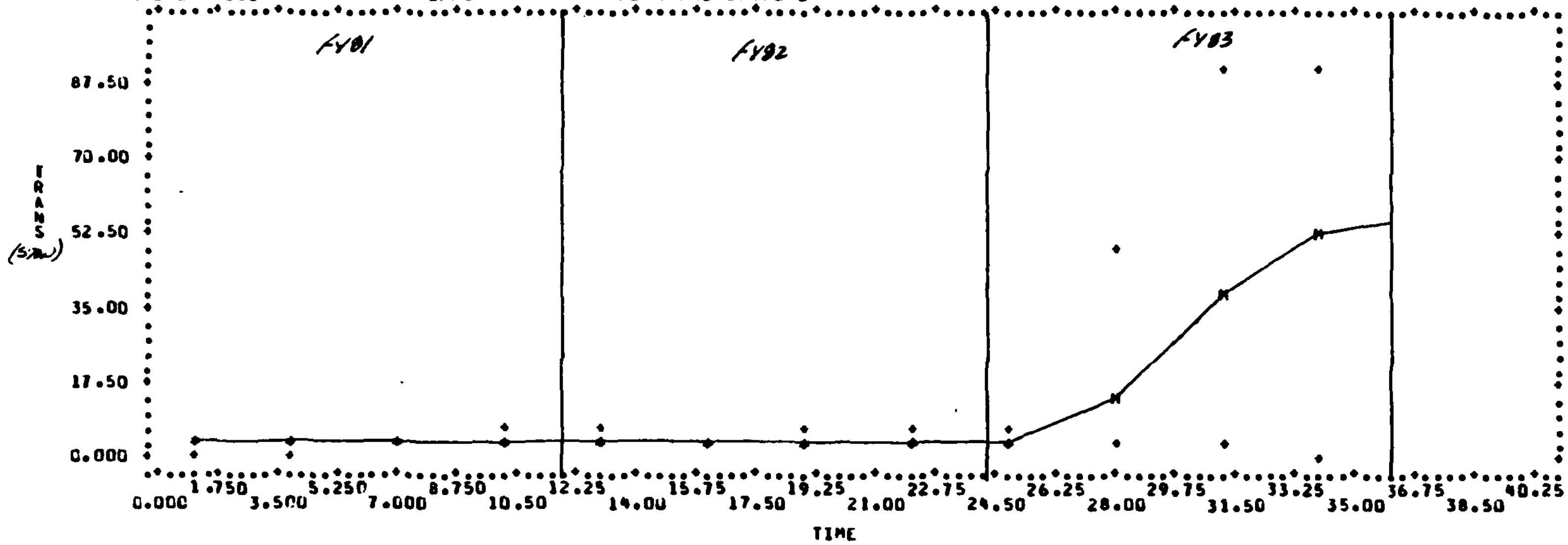
Figure G-14. Travis to Subic Cargo Distribution List (STON/month)
(page 1 of 2 pages)

F	D	Y
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	8
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
8	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

S	V	4
0	0	0
0	0	0
0	0	0
0	71	0
7	1	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	19	0
0	0	0
0	23	0
0	0	0
0	0	0
0	0	13
0	0	0
0	0	0
0	0	0
0	12	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	253	0
0	19	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	1626	0
0	0	0

Figure G-14. Travis to Subic Cargo Distribution List (STON/month) (page 2 of 2 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0115	2.5272	3.8645
4.000	6	.0115	3.2485	4.4875
7.000	6	2.8440	3.7172	4.4875
10.000	6	2.6395	3.5347	5.2505
13.000	6	2.1150	3.2446	5.2505
16.000	6	2.1150	2.7441	3.3715
19.000	6	2.1625	3.4691	5.6545
22.000	6	2.2990	3.5172	5.6545
25.000	6	2.2990	4.1612	6.4965
28.000	6	4.0240	12.5567	49.9965
31.000	6	4.1640	40.0244	91.9390
34.000	6	.0000	51.8311	91.9390

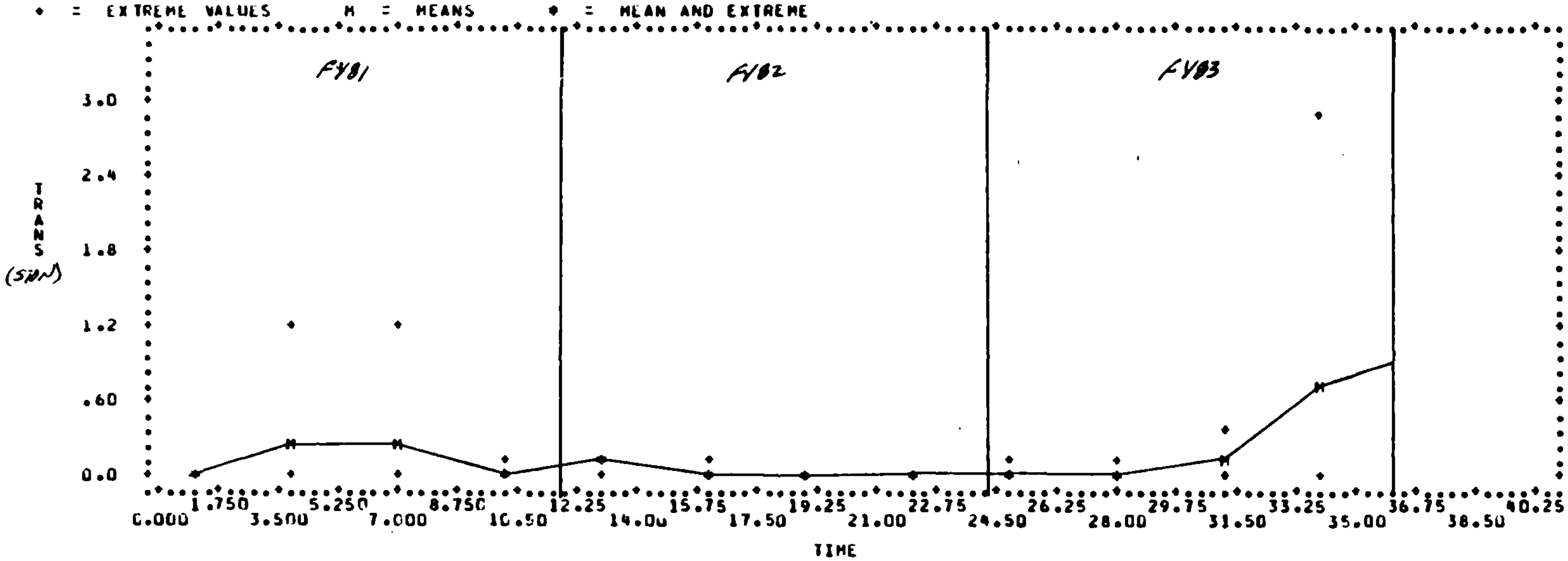
A

23	6743	12685
7411	6333	12997
7729	4230	6046
7775	5426	8626
8975	5830	8326
7065	4365	99993
5688	6666	93646
7310	11309	183876
7789	6631	65828
10501	6211	88769
5649	4596	91709
5279	5392	166918

Figure G-15. Three-month Moving Average Schematic
(Travis to Hickam) (STON/month)
(page 1 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

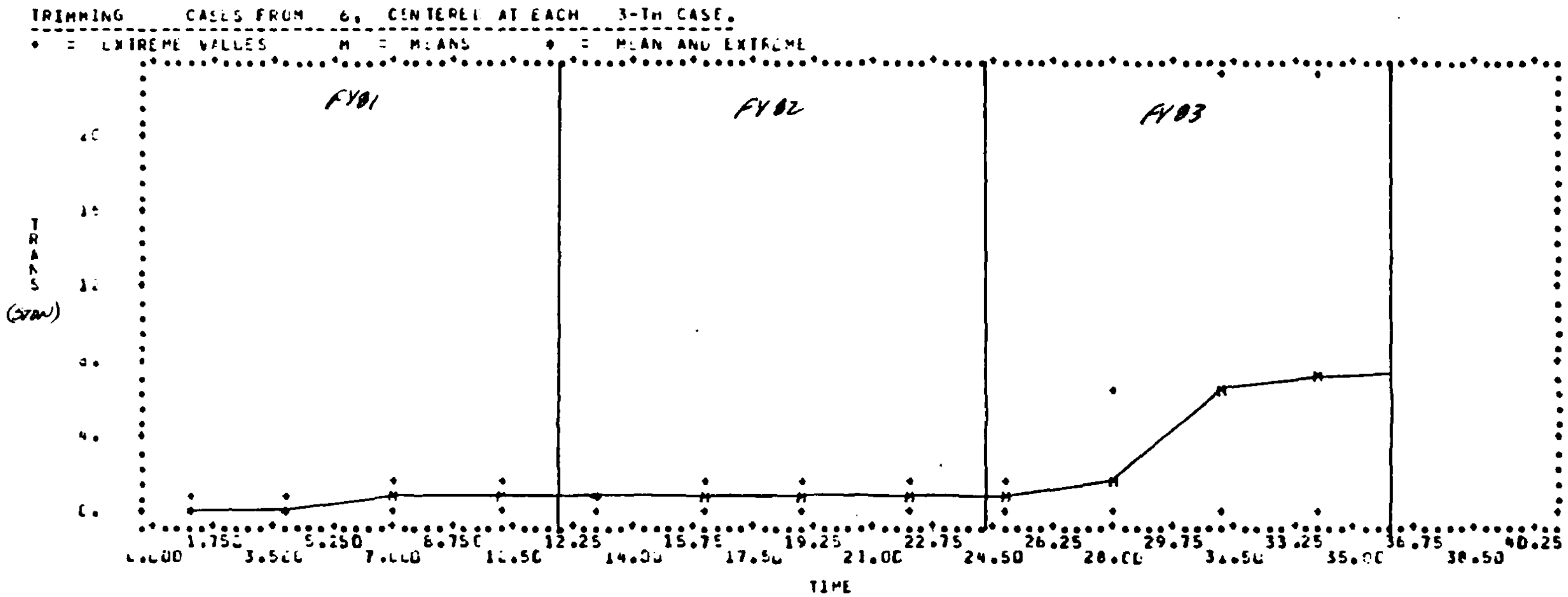
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0015	.0033	.0050
4.000	6	.0000	.2113	1.2475
7.000	6	.0000	.2197	1.2475
10.000	6	.0025	.0522	.0970
13.000	6	.0030	.0687	.0970
16.000	6	.0000	.0326	.0665
19.000	6	.0000	.0162	.0380
22.000	6	.0020	.0202	.0300
25.000	6	.0160	.0377	.1205
28.000	6	.0110	.0374	.1205
31.000	6	.0110	.1798	.4045
34.000	6	.0000	.6907	2.9200

3	139	58
10	6	33
7	173	241
2445	0	22
0	55	23
21	18	72
[illegible]	[illegible]	556
5	[illegible]	809
[illegible]	4	674
[illegible]	[illegible]	541
[illegible]	[illegible]	407
[illegible]	[illegible]	5840

Figure G-15. Three-month Moving Average Schematic
(Travis to Hickam) (STON/month)
(page 2 of 5 pages)

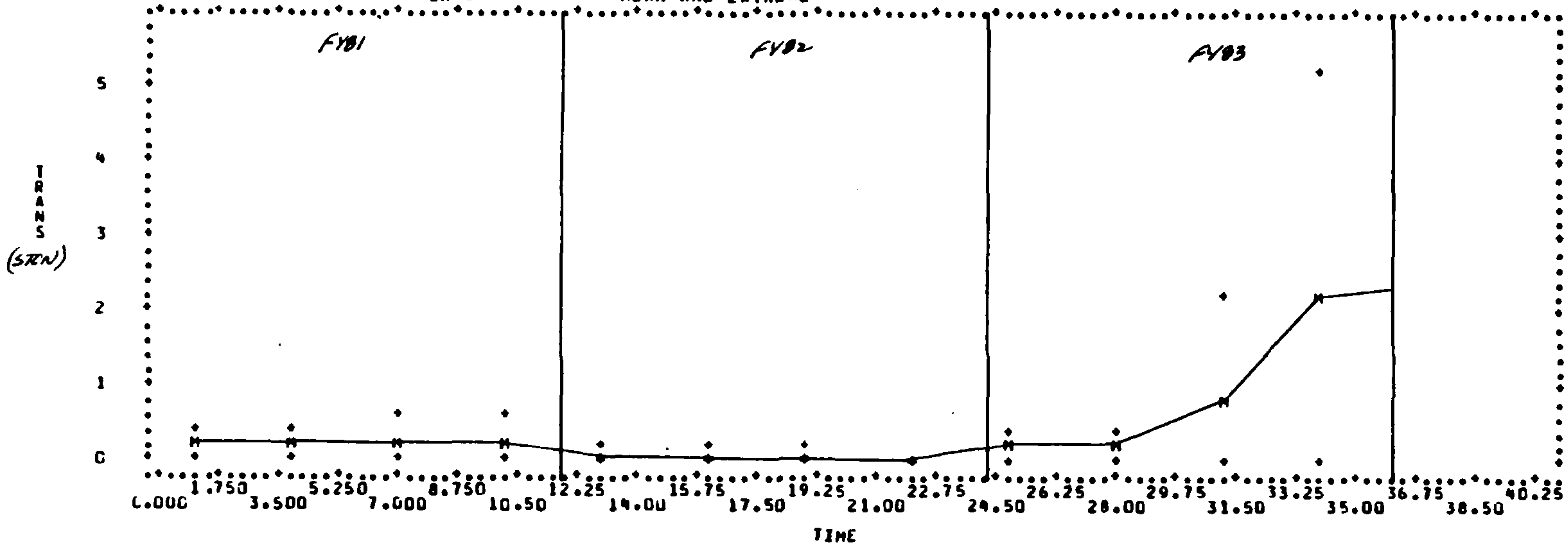


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.2690	.4105
4.000	6	.0000	.3672	.8375
7.000	6	.1320	.6580	1.4110
10.000	6	.1370	.6373	1.4110
13.000	6	.1370	.4882	.7265
16.000	6	[illegible]	.6031	1.3675
19.000	6	.0740	.4077	1.3675
22.000	6	.0740	.4547	1.9320
25.000	6	.1395	.6174	1.8120
28.000	6	.1395	1.5085	6.7455
31.000	6	[illegible]	6.2029	22.9645
34.000	6	.0000	7.1297	22.9645

M		
0	693	279
793	1416	693
621	1203	1629
244	2735	1244
873	622	566
1675	566	13491
2622	363	45929
981	148	3143
1301	438	10662
617	3064	13077
1453	333	16091
274	611	13332

Figure G-15. Three-month Moving Average Schematic
(Travis to Hickam) (STON/month)
(page 3 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0005	.1548	.4090
4.000	6	.0005	.1024	.4090
7.000	6	.0150	.1371	.5700
10.000	6	.0120	.1590	.5700
13.000	6	.0120	.0899	.2350
16.000	6	.0345	.0843	.1205
19.000	6	.0155	.0640	.1175
22.000	6	.0155	.0497	.0860
25.000	6	.0030	.1348	.3845
28.000	6	.0030	.2365	.4190
31.000	6	.0805	.7307	2.2605
34.000	6	.0000	2.1041	5.2995

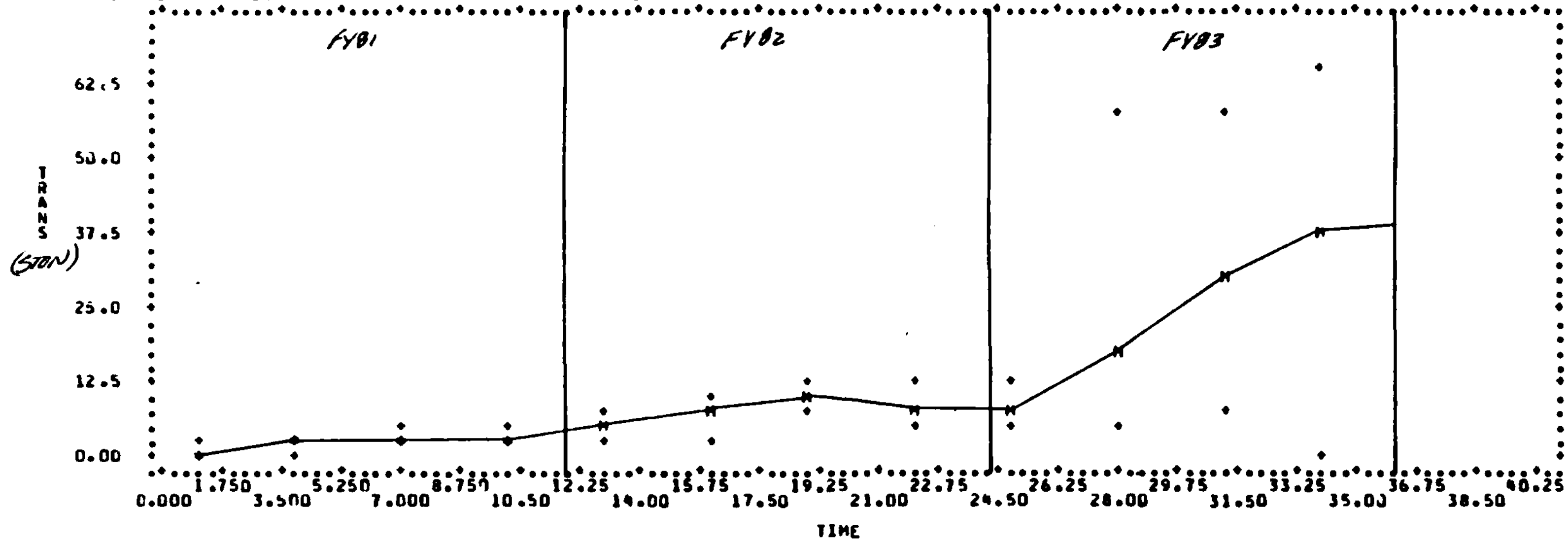
M

1	241	765
618	216	6
110	69	159
107	235	161
117	71	545
76	190	836
30	92	569
175	149	1774
1140	31	4521
24	60	7560
470	172	10599
69	92	7786

Figure G-15. Three-month Moving Average Schematic
(Travis to Hickam) (STON/month)
(page 4 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS # = MEAN AND EXTREME



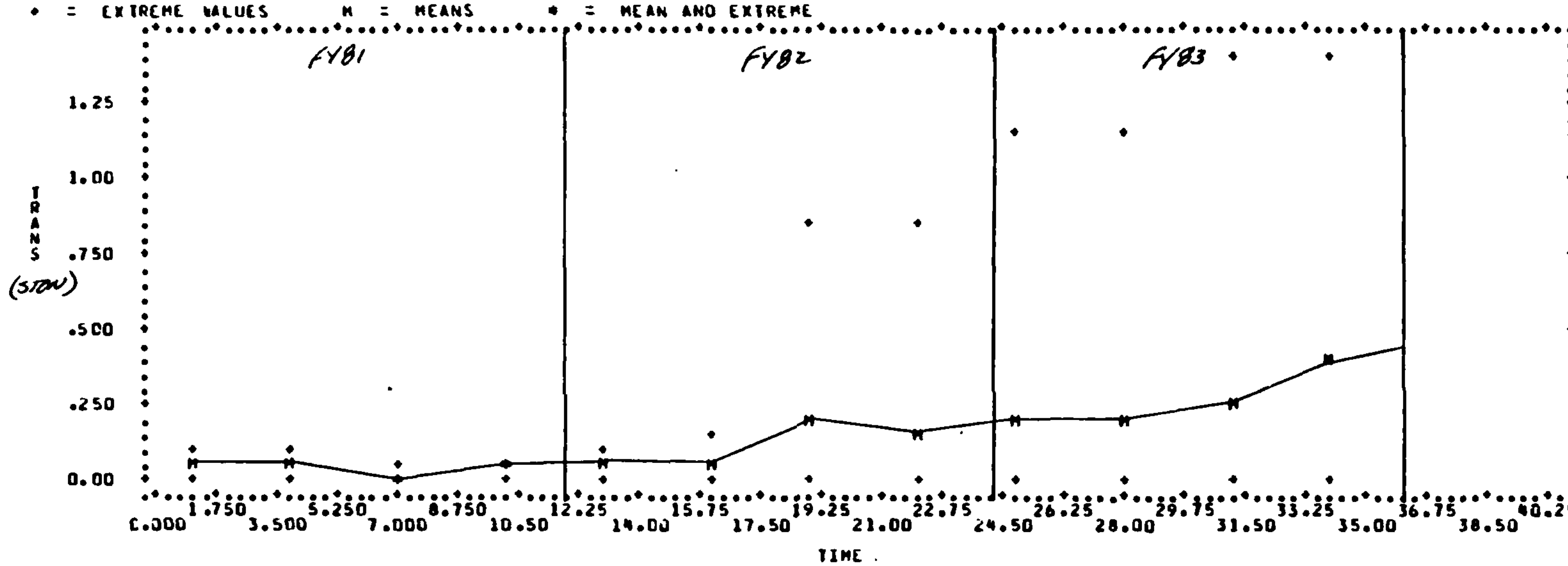
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.9913	1.9370
4.000	6	.0000	1.7231	3.2205
7.000	6	1.7770	2.9112	3.9735
10.000	6	2.3105	3.3835	4.0445
13.000	6	2.5155	4.3800	7.9355
16.000	6	3.2100	6.7296	9.1980
19.000	6	6.9755	8.9917	12.7095
22.000	6	5.3680	8.6803	12.7095
25.000	6	4.9600	7.9803	13.0145
28.000	6	4.9800	17.3532	58.4120
31.000	6	8.4120	29.6351	58.4120
34.000	6	.0000	37.0979	64.8245

V

0	9672	14919
2074	6420	9960
3874	15871	26029
6441	18396	16824
3554	16245	23682
4734	13951	116824
7637	25419	86344
4621	15096	39012
7947	15793	72935
5031	20014	101131
7277	10776	129649
6089	14066	117235

Figure G-15. Three-month Moving Average Schematic
(Travis to Hickam) (STON/month)
(page 5 of 5 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.
• = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0467	.1215
4.000	6	.0000	.0311	.1215
7.000	6	.0080	.0198	.0280
10.000	6	.0085	.0319	.0585
13.000	6	.0035	.0413	.1050
16.000	6	.0015	.0465	.1450
19.000	6	.0015	.1906	.8545
22.000	6	.0015	.1703	.8545
25.000	6	.0000	.1992	1.1515
28.000	6	.0000	.1995	1.1515
31.000	6	.0030	.2457	1.3900
34.000	6	.0000	.4227	1.3900

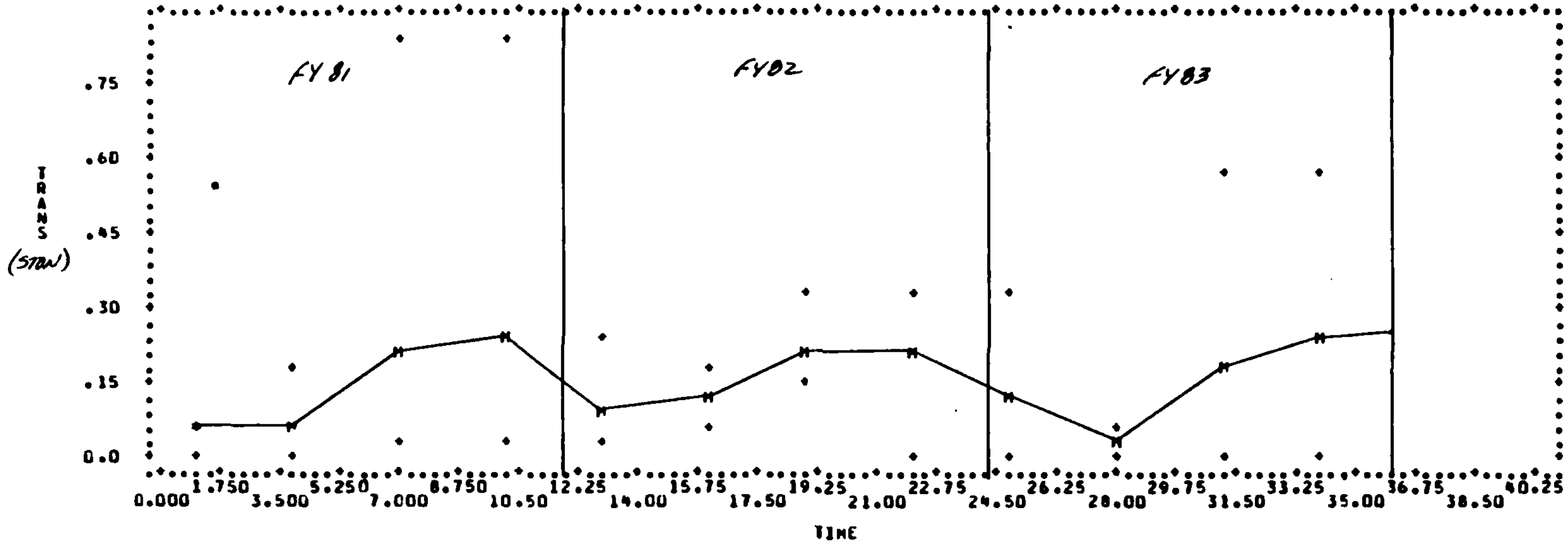
A

0	7	31
37	41	2303
243	210	0
49	3	10
16	490	16
28	7	35
34	[illegible]	106
55	1719	278[illegible]
56	273	[illegible]
114	48	579
117	3	1689
17	6	295

Figure G-16. Three-month Moving Average Schematic
(Travis to Clark) (STON/month)
(page 1 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME

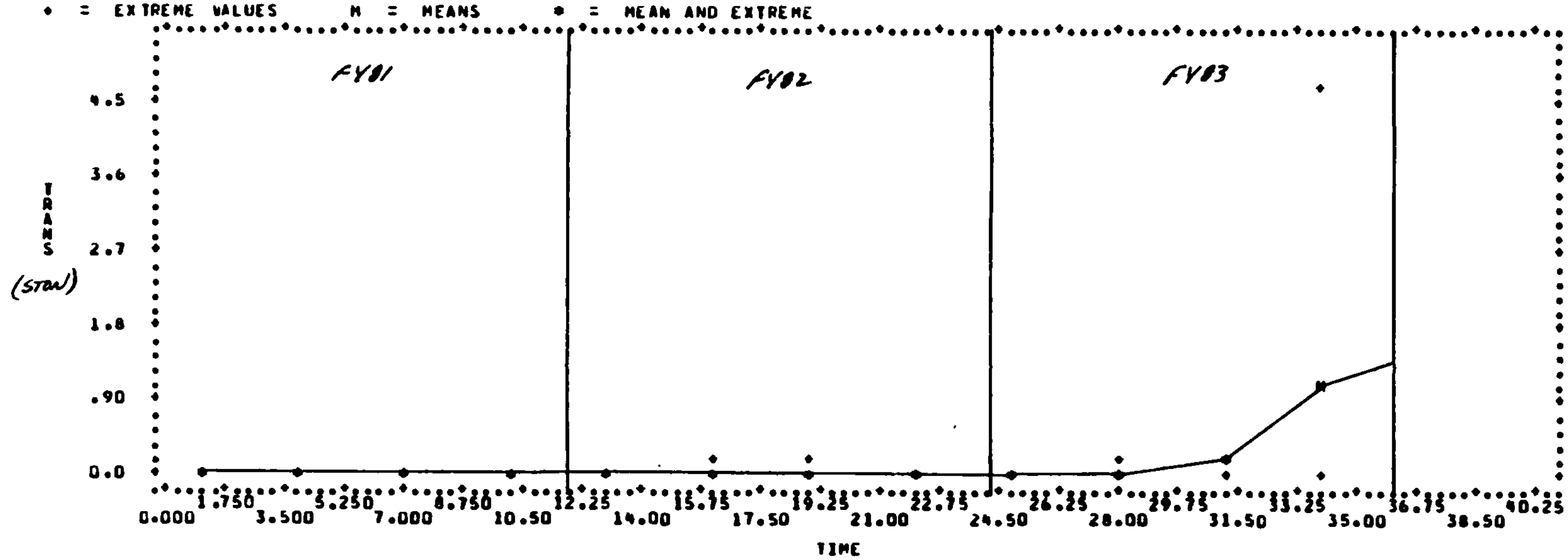


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	M		
1.000	3	.0020	.0458	.0710	4	117	8
4.000	6	.0020	.0732	.1670	142	115	103
7.000	6	.0170	.2209	.8400	129	104	113
10.000	6	.0170	.2277	.8400	40	315	17
13.000	6	.0205	.0850	.2545	374	316	119
16.000	6	.0520	.1096	.1740	229	348	0
19.000	6	.1465	.2116	.3370	334	293	1104
22.000	6	.0085	.2240	.3370	1680	593	82
25.000	6	.0040	.1127	.3250	34	674	891
28.000	6	.0000	.0300	.0595	41	17	212
31.000	6	.0000	.1894	.5823	519	461	500
34.000	6	.0000	.2407	.5820	134	650	0

Figure G-16. Three-month Moving Average Schematic
(Travis to Clark) (STON/month)
(page 2 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

◆ = EXTREME VALUES M = MEANS ✱ = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0105	.0180
4.000	6	.0000	.0155	.0385
7.000	6	.0000	.0199	.0460
10.000	6	.0000	.0153	.0460
13.000	6	.0000	.0114	.0295
16.000	6	.0000	.0331	.1365
19.000	6	.0000	.0367	.1365
22.000	6	.0000	.0268	.0570
25.000	6	.0200	.0457	.0815
28.000	6	.0105	.0668	.2025
31.000	6	.0105	.1152	.2285
34.000	6	.0000	1.0387	4.7640

V		
0	15	97
36	32	79
[illegible]7	[illegible]2	163
10	273	21
36	0	37
77	5	405
24	0	232
[illegible]	35	457
52	77	231
9	40	4680
[illegible]	114	9526
0	56	2617

Figure G-16. Three-month Moving Average Schematic
(Travis to Clark) (STON/month)
(page 3 of 3 pages)

A	C	H	M
0	0	0	0
4	29	46	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
6	0	0	0
5	0	0	0
0	0	0	0
15	0	0	0
0	0	0	0
0	0	0	0
15	0	0	0
0	0	0	0
0	0	68	0
0	0	32	0
4	0	0	107
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
3	1	0	0
0	0	7	0
0	0	0	0
0	0	2114	0
0	0	30	0
19	0	153	0
0	0	0	0
0	0	74	0
500	0	0	0
0	0	85	0
0	0	0	0
0	0	136	0
0	0	0	0
2	0	31	0
0	0	0	0

B	G	J	N
0	0	0	0
0	0	0	0
0	0	0	0
0	5	0	0
0	5	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	9	0	0
0	594	0	0
0	0	0	0
0	432	0	0
0	5	0	0
0	4	0	0
0	8	0	0
0	0	0	0
2050	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	3	0	0
0	0	13	0
0	0	0	0
0	4	0	0
0	4	0	0
0	4	0	0
0	188	0	0
78	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	184	0	0

Figure G-17. Travis to Diego Garcia Cargo Distribution List (STON/month) (page 1 of 2 pages)

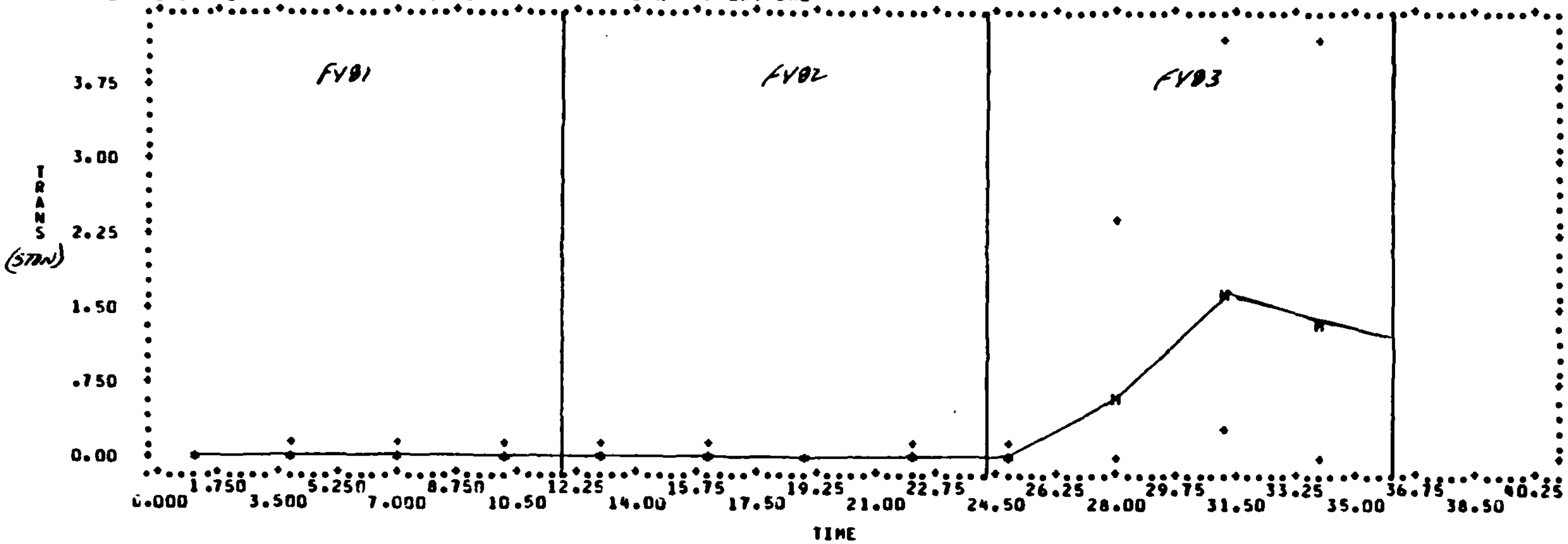
F	W
0	0
0	0
0	0
0	0
0	0
0	0
0	0
5	0
0	0
0	0
0	70
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

U
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
57100
1527
0
1102
512
525
1020
500
0
0

Figure G-17. Travis to Diego Garcia Cargo Distribution List (STON/month) (page 2 of 2 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



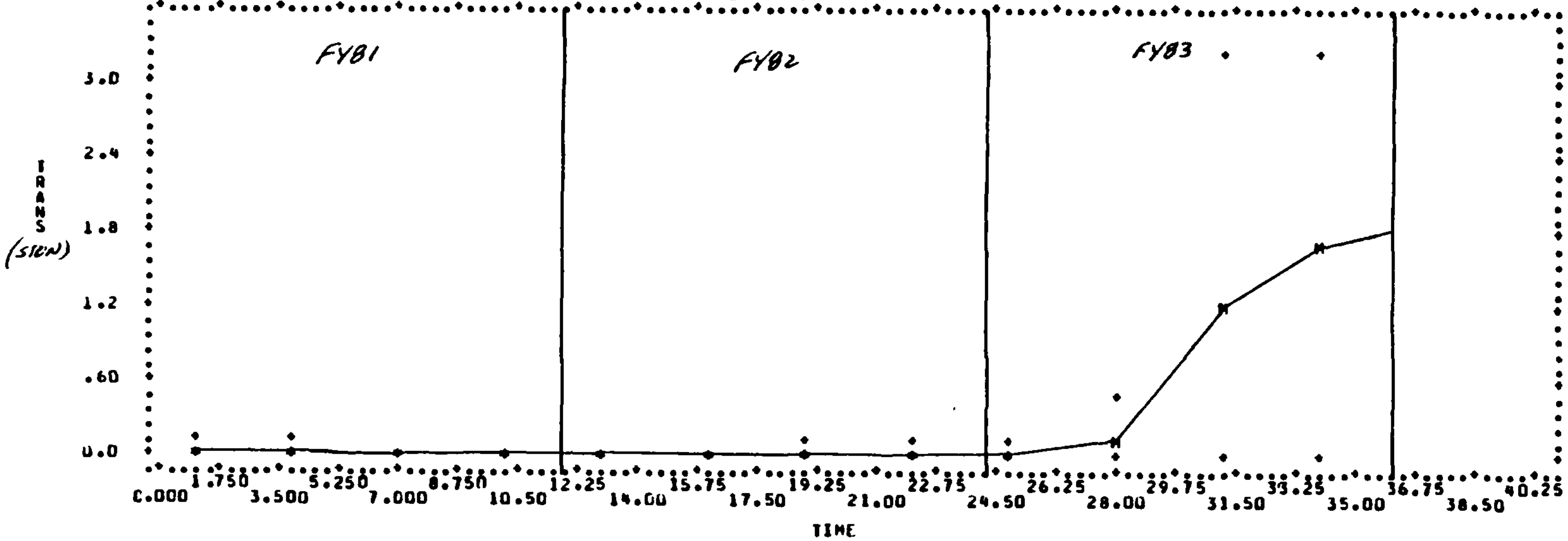
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0252	.0525
4.000	6	.0000	.0322	.0870
7.000	6	.0000	.0283	.0870
10.000	6	.0000	.0424	.0840
13.000	6	.0125	.0571	.0925
16.000	6	.0125	.0368	.0925
19.000	6	.0175	.0334	.0625
22.000	6	.0095	.0384	.0830
25.000	6	.0095	.0626	.1105
28.000	6	.0535	.5810	2.3915
31.000	6	.2390	1.6530	4.2665
34.000	6	.0060	1.3002	4.2665

A

46	185	221
105	25	202
0	71	107
17	57	1181
44	36	478
174	66	4783
26	35	8533
77	125	4169
0	80	692
134	19	240
102	36	12
168	166	1956

Figure G-18. Three-month Moving Average Schematics
(Travis to Kadena) (STON/month)
(page 1 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



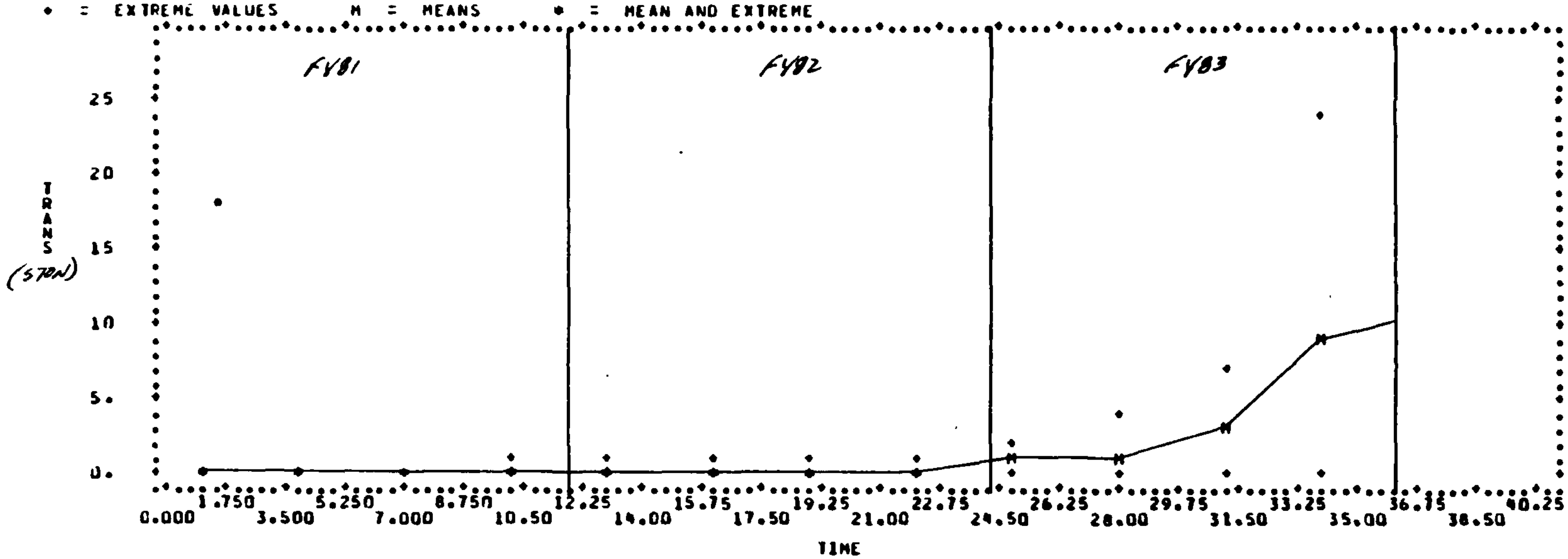
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0327	.0980
4.000	6	.0000	.0266	.0980
7.000	6	.0020	.0137	.0550
10.000	6	.0015	.0157	.0400
13.000	6	.0000	.0129	.0400
16.000	6	.0000	.0031	.0080
19.000	6	.0000	.0258	.0890
22.000	6	.0000	.0266	.0890
25.000	6	.0000	.0183	.0695
28.000	6	.0000	.1122	.4815
31.000	6	.0000	1.1712	3.1990
34.000	6	.0000	1.6469	3.1990

0	0	9
0	8	135
196	0	34
8	10	202
5	3	0
110	16	963
16	0	1388
4	178	5104
22	103	6398
3	17	4676
14	0	2955
60	21	3918

Figure G-18. Three-month Moving Average Schematics
(Travis to Kadena) (STON/month)
(page 2 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	V		
1.000	3	.0000	.2095	.3360	0	804	3230
4.000	6	.0000	.2352	.3360	585	663	1137
7.000	6	.2260	.2682	.2980	672	809	608
10.000	6	.2305	.3456	.5395	452	749	709
13.000	6	.2305	.3775	.5395	518	699	479
16.000	6	.3315	.4189	.5515	595	1103	8154
19.000	6	.3745	.4542	.5515	596	816	2255
22.000	6	.3555	.4633	.6970	493	1007	13078
25.000	6	.3040	.6530	1.6150	564	676	12307
28.000	6	.2395	1.1931	4.0770	954	756	30634
31.000	6	.2395	3.0818	6.5390	1079	711	48961
34.000	6	.0000	9.3261	24.4805	461	1394	35312

Figure G-18. Three-month Moving Average Schematics
(Travis to Kadena) (STON/month)
(page 3 of 3 pages)

B	E	J	M
0	0	0	0
0	0	6	0
0	15	52	0
0	48	14	0
0	0	0	0
0	0	0	0
1	0	32	0
24	0	0	0
18	0	0	0
0	0	0	0
0	0	163	0
0	0	60	15
0	56	0	0
16	0	0	0
27	0	7	0
48	2	0	0
0	10	0	17
0	13	0	0
0	0	0	0
0	0	108	0
0	411	92	6
0	0	37	0
13	0	0	0
0	181	25	0
0	20	2	0
41	0	4	0
0	41	0	0
32	0	8	0
66	0	0	0
0	0	0	0
0	0	440	0
0	0	0	0
0	0	1281	0
0	0	0	0
0	0	0	0
6491	0	229	0

C	F	K	N
0	0	0	0
0	0	0	0
18	0	0	0
0	0	0	0
21	0	0	0
5	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	7
0	0	0	0
13	0	0	0
0	0	0	0
3	0	0	0
0	0	0	0
0	0	0	0
0	0	24	0
0	0	8	0
20	0	0	0
3	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
68	0	0	0
0	0	0	0
0	0	160	0
0	0	0	0
0	0	0	0
0	0	0	0

Figure G-19. Travis to Kadena Cargo Distribution List (STON/month)
(page 2 of 2 pages)

F	U
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

S	Y
0	0
173	0
0	44
0	44
58	100
0	0
6	0
0	63
0	0
0	22
56	0
0	0
0	33
0	0
0	24
0	11
0	0
0	22
0	0
0	0
0	22
0	0
0	22
0	22
23	56
0	0
0	71
0	44
17	0
0	112
0	0
1	0
0	544
0	0
0	0
0	112

Figure G-19. Travis to Kadena Cargo Distribution List (STON/month)
(page 1 of 2 pages)

B	E	F	J
0	0	0	0
92	159	0	152
78	469	0	47
532	2200	18	73
687	1206	6	296
505	1334	0	0
4268	674	0	73
2543	176	0	88
220	767	0	30
1464	658	18	10
321	860	0	127
715	49	0	37
398	534	0	62
631	1482	0	65
157	1879	0	129
741	657	0	19
1335	3954	0	36
453	6724	11	92
2647	3898	0	14
622	2289	2	120
28	3918	0	0
454	2777	0	111
1660	2921	0	35
323	4166	13	454
529	1937	7	27
150	1492	0	15
1299	2305	5	131
1828	1106	0	37
2290	2188	1	29
18159	14256	0	505
6999	9515	0	780
10195	5290	0	0
515	3662	149	1252
6842	3798	0	893
17168	3929	0	532
4386	286	100	86

C	D	G	K
0	0	0	0
312	17	0	0
18	35	0	0
239	0	0	249
364	0	100	14
227	0	191	20
315	0	0	649
122	0	0	36
238	0	0	7
496	0	0	341
3413	35	537	12
346	17	0	115
91	0	13	93
112	17	0	45
178	0	41	720
407	0	2	0
394	0	0	0
520	0	0	0
439	17	90	3
118	0	193	9
56	0	26	82
368	0	15	0
426	0	0	25
1827	0	14	0
464	0	24	0
250	0	6	408
460	0	14	6
152	0	0	2
292	72	4	154
2159	0	1936	290
3832	0	132	4110
9513	0	166	2605
945	0	55	4115
1636	0	167	0
2327	0	219	0
5619	1600	0	3570

Figure G-20. Travis to Osan Cargo Distribution List (STON/month) (page 1 of 3 pages)

N	P	T	Y
0	0	0	0
0	0	0	12
301	0	0	155
139	0	54	56
0	0	0	67
0	0	0	44
29	0	0	500
0	0	0	56
0	0	0	47
0	0	0	900
0	0	0	92
0	0	0	22
0	0	0	0
0	0	765	247
0	0	0	59
0	0	0	124
0	0	0	122
0	43	0	68
0	0	0	100
0	0	0	5
0	0	0	94
0	0	0	0
0	0	0	97
0	0	0	104
0	0	261	105
0	0	0	182
0	0	0	28
0	0	0	4
0	0	0	44
0	0	0	448
0	0	0	2687
0	0	0	280
0	0	0	868
0	0	0	0
0	0	0	0
0	0	0	1374

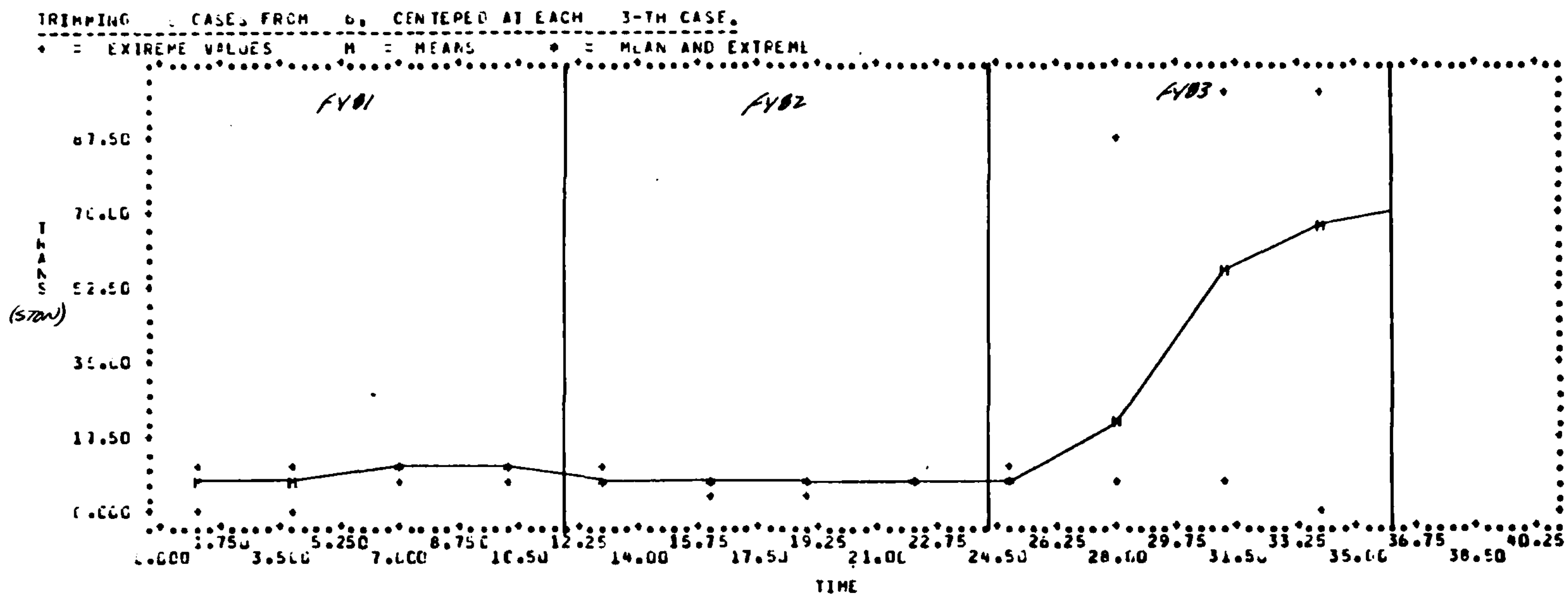
P	S	W	Z
0	0	0	0
186	61	2504	0
24	8	4605	0
54	19	20	0
19	0	79	0
47	1394	5424	0
126	542	2386	0
183	304	691	0
77	3172	143	0
32	2	31	0
15	201	24	28
6	315	95	0
43	0	85	0
175	104	0	286
165	73	0	0
36	0	0	42
17	22	0	156
7	55	0	0
624	520	0	0
93	15	0	0
230	0	0	0
4	257	0	0
120	25	0	0
29	115	0	0
15	78	0	0
111	4	0	0
442	247	0	0
635	461	0	0
612	728	0	82
145	590	0	0
244	454	0	0
175	743	0	0
394	223	0	0
558	257	0	0
721	283	0	0
1146	27456	0	0

Figure G-20. Travis to Osan Cargo Distribution List (STON/month) (page 2 of 3 pages)

2	4
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
7193	0
4704	70
0	2
10	2103
4630	1
12	5
0	0
8	0
6	0
0	3
0	0
54	0
0	6
0	0
0	0
654	0
0	0
2914	0
6650	1060

3
0
0
0
0
0
0
0
0
0
0
0
0
0
0
3
0
0
0
0
12
0
0
0
0
0
0
0
0
0
2360
0
0
0
0
3
0

Figure G-20. Travis to Osan Cargo Distribution List (STON/month)
(page 3 of 3 pages)



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	[illegible]70	6.7927	10.9425
4.000	6	.0275	8.0091	11.6655
7.000	6	7.8215	9.5978	11.6655
10.000	6	6.0160	8.7925	11.2370
13.000	6	6.0160	7.5460	8.6020
16.000	6	3.9925	5.9553	7.8580
19.000	6	3.9925	6.[illegible]837	6.2165
22.000	6	6.[illegible]75	7.3129	8.2165
25.000	6	6.[illegible]	6.2437	10.7165
28.000	6	5.7395	21.4526	86.4685
31.000	6	5.7395	54.2997	96.745[illegible]
34.000	6	.7600	65.3292	96.745[illegible]

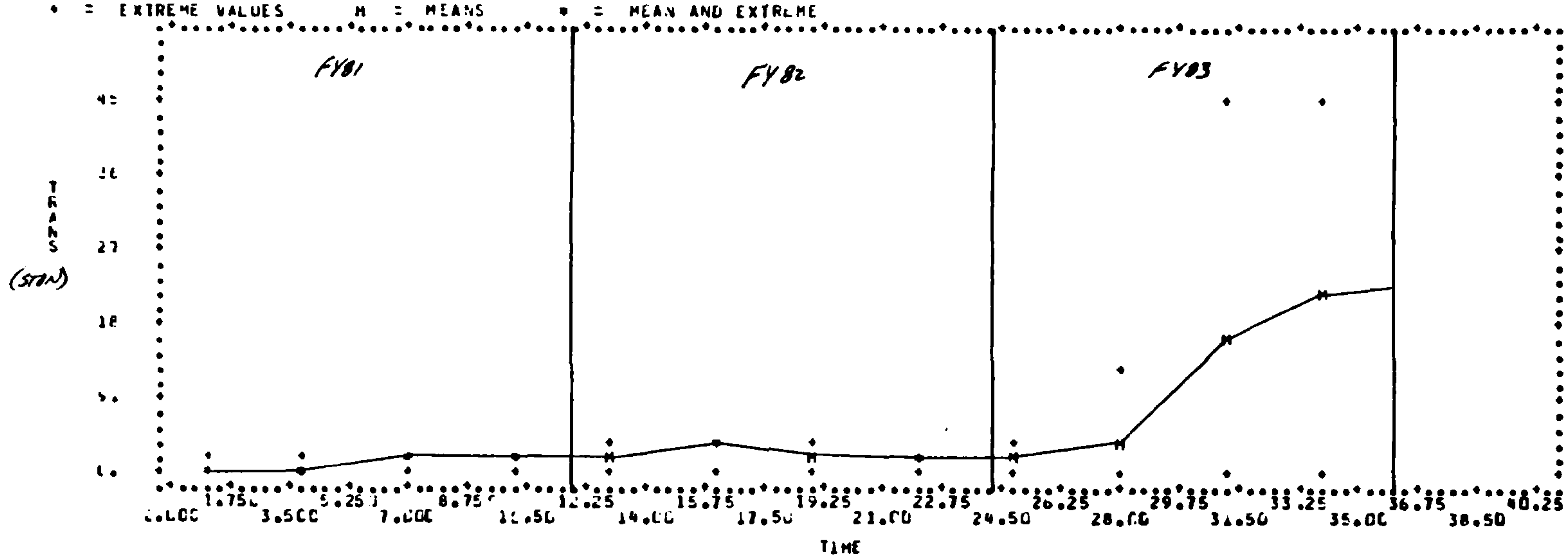
A

54	14275	16999
18617	14672	19141
21685	15716	21433
16375	9690	11479
23331	8976	15442
15647	7965	172937
19719	10347	197430
15628	10433	136039
20474	13024	117469
17724	15341	153736
15933	12107	190003
17032	13043	140649

Figure G-21. Three-month Moving Average Schematic
(Travis to Osan) (STON/month)
(page 1 of 4 pages)

TRIPPING 6 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

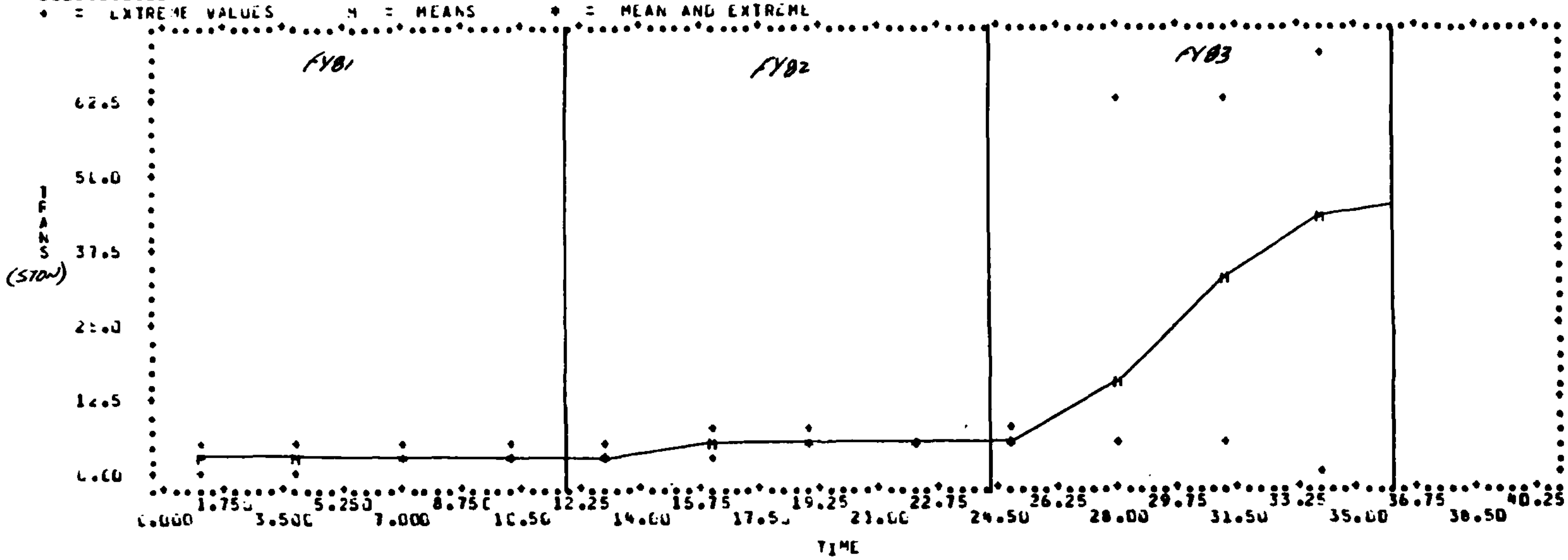
* = EXTREME VALUES   M = MEANS   * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE		M		
1.000	3	.0050	.5022	1.1730		10	6011	4206
4.000	6	.[illegible]50	.6812	1.7685		657	1278	1313
7.000	6	.6545	1.4122	2.527[illegible]		2346	8[illegible]1	7514
10.000	6	.7260	1.7830	2.5273		13[illegible]9	8475	2289
13.000	6	.6390	2.4917	4.30[illegible]		2675	6481	1519
16.000	6	.63[illegible]	3.1195	4.3005		3577	4586	23576
19.000	6	.674[illegible]	2.2[illegible]	4.2375		2679	2630	89482
22.000	6	.51[illegible]5	[illegible].1104	1.667[illegible]		14[illegible]2	2610	49774
25.000	6	.[illegible]15	1.0143	3.757[illegible]		[illegible]0[illegible]4	1746	31907
28.000	6	.6565	3.3684	11.769[illegible]		4540	1023	39214
31.000	6	.7555	16.5457	44.741[illegible]		4306	1980	46522
34.000	6	.0100	21.2077	44.7410		3165	3334	36607

Figure G-21. Three-month Moving Average Schematic
(Travis to Osan) (STON/month)
(page 2 of 4 pages)

TRIPPING CASES FROM 6, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



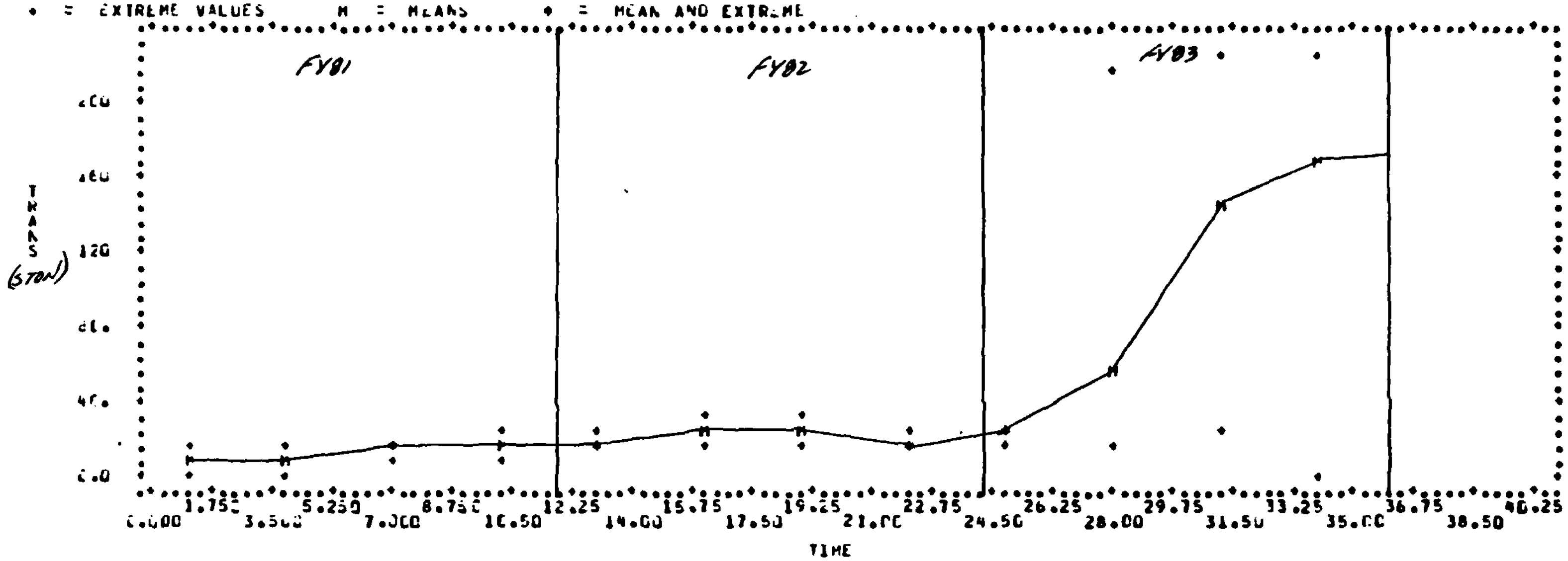
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0115	2.5365	5.7195
4.000	6	[illegible]	3.3364	5.7195
7.000	6	2.7950	3.5785	4.6765
10.000	6	2.7950	3.2743	4.0365
13.000	6	2.9350	3.7239	4.4965
16.000	6	3.2145	4.6856	6.2665
19.000	6	4.2755	5.1478	6.2665
[illegible]	6	[illegible]	4.8471	[illegible]
25.000	6	3.9150	5.0577	6.5415
28.000	6	4.2135	14.3712	61.3585
31.000	6	4.2135	32.9653	61.3585
34.000	6	[illegible]	42.1332	70.3660

M		
23	8198	8597
3757	8592	9914
11439	6429	13083
6600	6551	8427
6665	11624	9717
4353	12573	122717
6418	11664	93705
5548	9307	68125
6176	8695	72693
5978	11544	91499
7117	7870	110104
6073	10725	140772

Figure G-21. Three-month Moving Average Schematic
(Travis to Osan) (STON/month)
(page 3 of 4 pages)

TRIMMING : CASES FROM 6, CENTERED AT EACH 3-TH CASE.

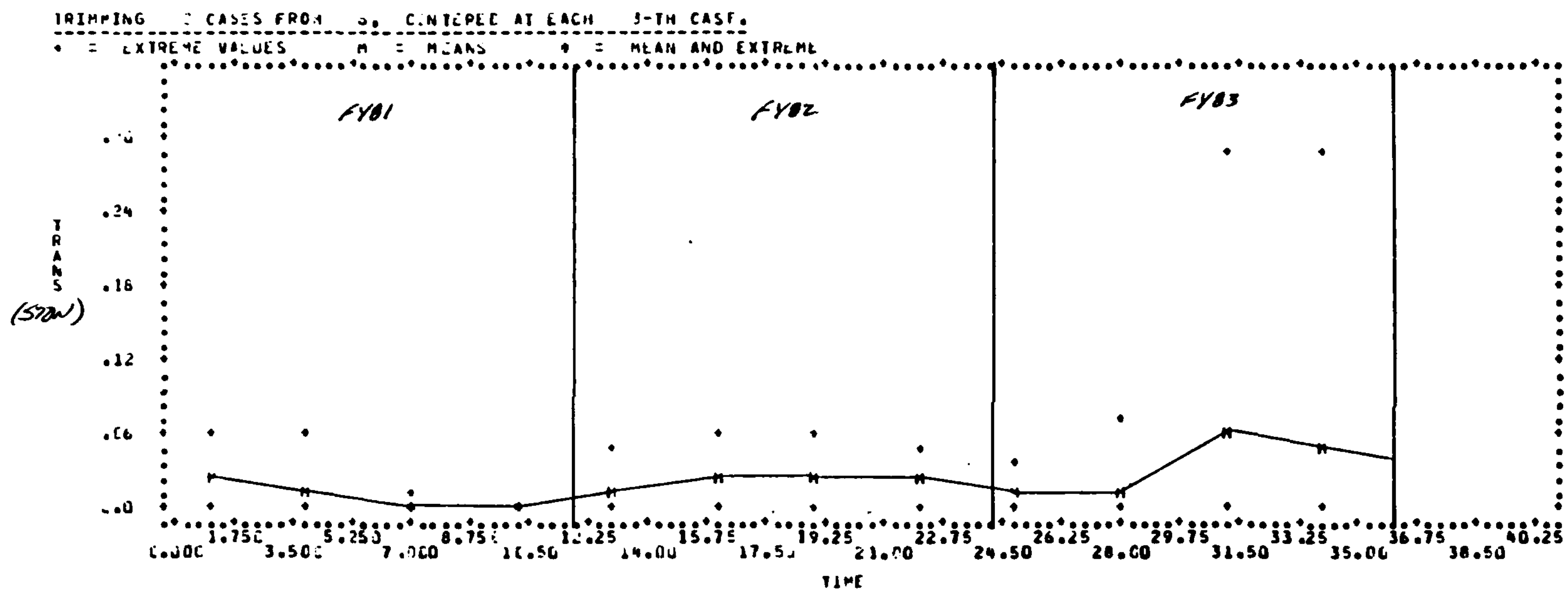
• = EXTREME VALUES   M = MEANS   ♦ = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.000	7.8943	13.706
4.000	6	.000	10.7582	19.1355
7.000	6	9.0335	12.6366	19.1310
10.000	6	11.0445	16.2633	23.785
13.000	6	14.1905	19.5674	23.7651
16.000	6	14.1905	22.3971	26.8655
19.000	6	14.546	21.3747	26.8855
22.000	6	14.546	17.7023	20.475
25.000	6	17.91	20.3655	25.7315
28.000	6	16.592	55.6325	219.7025
31.000	6	21.5275	144.6695	222.934
34.000	6	.000	169.1521	222.934

V		
0	41121	42850
21354	28381	37184
26012	36053	51463
38261	50033	55633
25415	51406	43855
18067	57771	438405
22089	36061	350973
23697	29052	445666
24120	32114	401100
35316	35006	416804
42298	40095	432506
47570	39240	399376

Figure G-21. Three-month Moving Average Schematic
(Travis to Osan) (STON/month)
(page 4 of 4 pages)



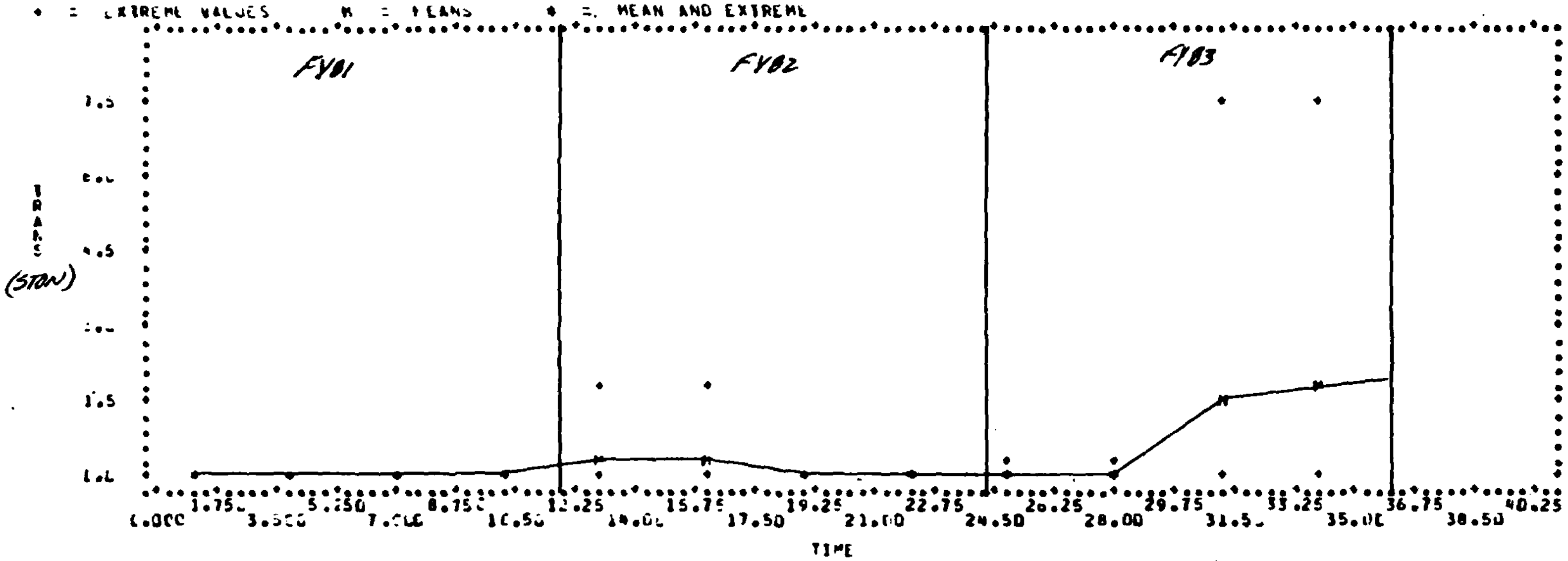
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	[illegible]	.0218	.06[illegible]
4.000	6	[illegible]	.0147	.060[illegible]
7.000	6	[illegible]	.0147	.014[illegible]
10.000	6	[illegible]	.0311	.0053
13.000	6	[illegible]	.0135	.0475
16.000	6	.0015	.0299	.063[illegible]
19.000	6	.0015	.0294	.063[illegible]
22.000	6	[illegible]	.025[illegible]	.0455
25.000	6	[illegible]	.0147	.0415
28.000	6	[illegible]	.0165	.078[illegible]
31.000	6	[illegible]	.0035	.2915
34.000	6	.0000	.0517	.2915

A		
9	32	0
120	05	0
2	44	19
28	3	23
0	126	3
17	69	156
0	91	0
10	14	0
2	50	583
0	83	241
0	8	0
1	66	38

Figure G-22. Three-month Moving Average Schematic
(Travis to Yokota) (STON/month)
(page 1 of 2 pages)

TRIMMING CASES FROM 6, CENTERED AT EACH 3-TH CASE.

• = EXTREME VALUES M = MEANS ♦ = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	H		
[illegible]	3	[illegible]	.0152	.7305	0	0	13
4.000	6	[illegible]	.0090	.0305	0	3603	579
7.000	6	[illegible]	.0046	[illegible]	61	16	20
10.000	6	[illegible]	.0074	[illegible]	1	68	9
[illegible]	6	[illegible]	[illegible]	[illegible]	36	42	36
[illegible]	6	[illegible]	.3169	[illegible]	10	54	576
19.000	6	[illegible]	.0187	[illegible]	8	0	14727
[illegible]	6	[illegible]	.0123	.0335	0	27	2474
[illegible]	6	[illegible]	[illegible]	.2895	0	13	0
[illegible]	6	[illegible]	[illegible]	.2895	48	19	797
[illegible]	6	[illegible]	1.4653	7.3635	33	67	3124
[illegible]	6	[illegible]	1.6937	7.3635	0	22	0

Figure G-22. Three-month Moving Average Schematic (Travis to Yokota) (STON/month) (page 2 of 2 pages)

E	C	F	J
0	0	4	0
0	0	0	0
0	0	24	72
11	0	0	0
0	0	0	0
0	0	3	0
0	0	0	5
0	0	16	50
0	0	0	0
0	0	0	0
0	0	0	43
0	0	0	0
0	0	0	0
25	0	0	0
83	0	0	0
0	69	0	163
10	0	0	0
0	0	0	81
3	0	0	96
0	0	0	0
0	0	0	48
0	0	0	0
0	0	0	34
11	0	0	33
0	0	0	13
0	0	0	14
0	0	0	0
0	0	0	0
0	64	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
320	0	0	547
0	0	0	536

C	E	G	K
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	54	0	0
0	0	0	0
0	0	0	0
0	0	0	0
5	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	37	0	0
0	160	0	0
0	0	0	5
10	16	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	4	0	0
0	10	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	44
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	770	0	0

Figure G-23. Travis to Yokota Cargo Distribution List (STON/month) (page 1 of 2 pages)

[illegible]	P	U	Y
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	22
0	0	0	0
0	0	0	0
0	0	0	0
0	3	0	11
0	0	0	33
0	0	0	0
0	0	0	44
0	0	0	0
1	0	0	0
0	0	0	0
0	0	0	78
0	0	0	22
0	0	0	0
0	0	0	22
0	0	0	22
0	0	0	0
0	0	0	33
0	0	0	0
0	0	0	33
0	0	0	44
0	0	0	20
0	0	0	7
6	0	0	0
0	0	0	0
0	0	0	33
116	0	0	446
0	0	0	0
54	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

[illegible]	S	V	3
0	0	0	0
0	0	2	0
0	0	0	0
0	0	22	0
0	0	58	0
0	0	1	0
0	0	6	0
0	3	22	0
0	0	46	0
0	47	32	0
1	0	3	0
0	0	44	0
0	0	327	0
0	0	148	0
0	0	69	0
0	0	7	0
0	0	346	0
0	0	54	0
0	0	112	0
0	0	321	0
0	0	79	0
0	0	49	0
0	0	25	0
0	0	0	335
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	1073	0
0	0	0	0
0	0	0	0
0	0	0	0
0	640	2735	0
0	0	0	0

Figure G-23. Travis to Yokota Cargo Distribution List (STON/month) (page 2 of 2 pages)

A	C	E	J
410	0	0	4987
762	0	0	5553
288	0	0	4377
359	0	0	6649
1017	0	0	4671
368	0	0	5675
530	0	0	7235
632	0	0	6957
1812	0	0	11935
143	0	0	12093
1602	0	0	15656
1208	71	0	10444
268	19	0	6660
766	1	0	7976
1180	0	22	7224
5324	0	31	8731
1327	0	12	8320
462	0	0	10150
544	0	0	11866
632	0	0	11253
1436	0	0	15767
1693	0	0	21420
8030	2786	0	53869
7976	53	0	26661
2048	0	0	19927
4421	0	0	32274
720	0	0	22873
3071	0	0	64536
6519	0	0	49646
33220	5	0	148872
10522	0	0	119518
2716	0	0	149638
5511	21	0	121076
44577	0	0	130147
11436	20	0	139218
44676	0	0	136257

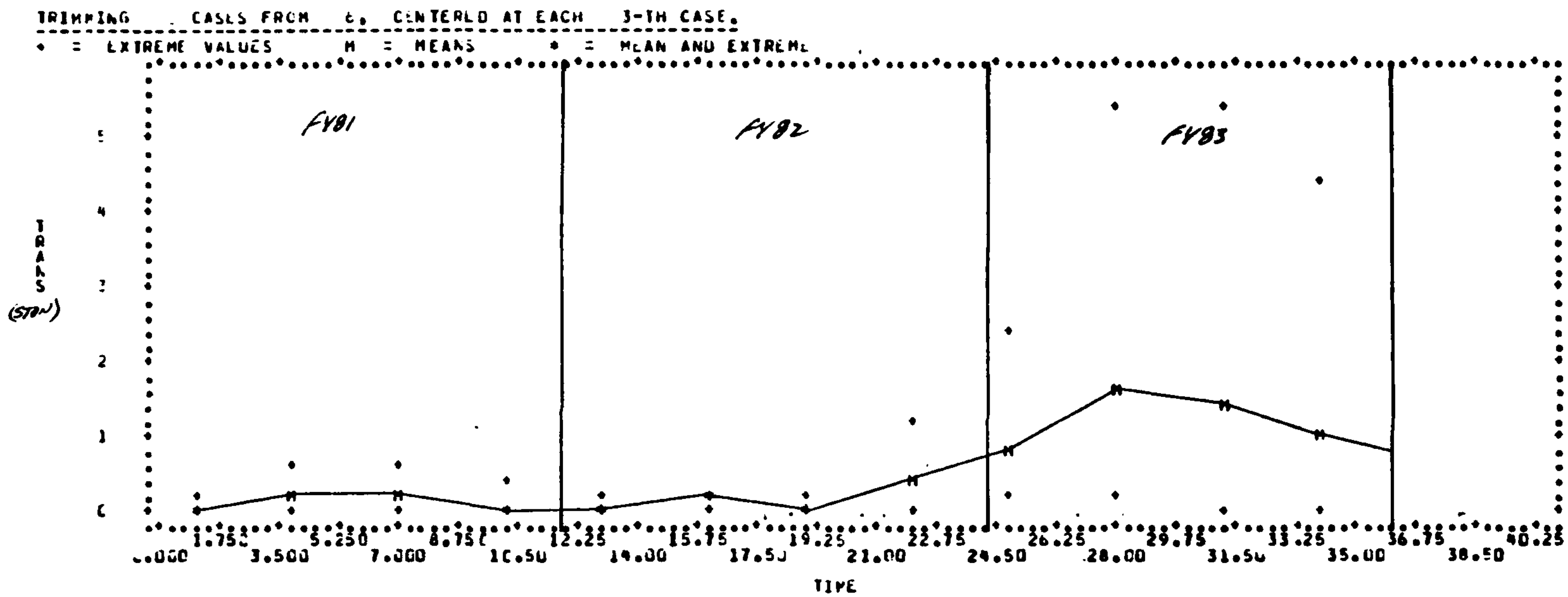
E	C	G	K
181	0	0	0
0	0	0	9
0	0	0	0
18	0	0	0
0	0	0	40
32	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	80	0
0	0	0	0
0	0	0	0
0	0	0	0
1	0	0	0
14	0	0	7
118	0	0	0
0	0	0	0
13	0	0	38
0	0	0	0
443	0	0	5
0	0	0	0
63	0	0	23
1	0	0	1
6	0	0	0
0	0	13029	0
47	0	0	0
0	0	0	0
0	0	0	0
119	0	0	0
33	0	0	0
2138	875	0	944
125	0	0	0
4	0	0	0
1057	0	0	0
169	0	0	0

Figure G-24. Tinker to Frankfurt Cargo Distribution List (STON/month) (page 1 of 2 pages)

N	S	W	Y
0	0	1	0
21	0	0	0
0	0	0	0
0	0	0	0
0	13	14	0
35	0	7	0
0	0	45	0
0	0	35	0
0	0	0	0
0	0	0	7
0	0	0	0
0	0	0	0
0	0	6	0
0	0	0	0
0	378	0	0
0	395	0	0
0	0	0	0
0	0	0	243
0	0	0	0
114	0	0	5
0	0	0	0
0	2	0	0
0	1	0	0
0	0	0	0
0	146	0	0
0	104	0	0
0	4	0	0
30	28	0	0
0	4	0	0
0	16	0	0
0	0	0	0
0	3	0	0
0	59	0	0
0	0	0	0
0	0	0	0
0	0	0	0

P	T	X	Z
0	170	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	141	0	0
0	0	0	0
0	0	0	0
0	269	0	0
36	158	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
16	63	0	0
0	0	0	0
0	160	0	0
0	293	0	57
0	0	0	0
0	238	0	0
0	144	0	4
0	0	0	0
0	0	0	0
0	1413	1	0
0	926	0	12
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	30
87	1550	0	0

Figure G-24. Tinker to Frankfurt Cargo Distribution List (STON/month)
(page 2 of 2 pages)

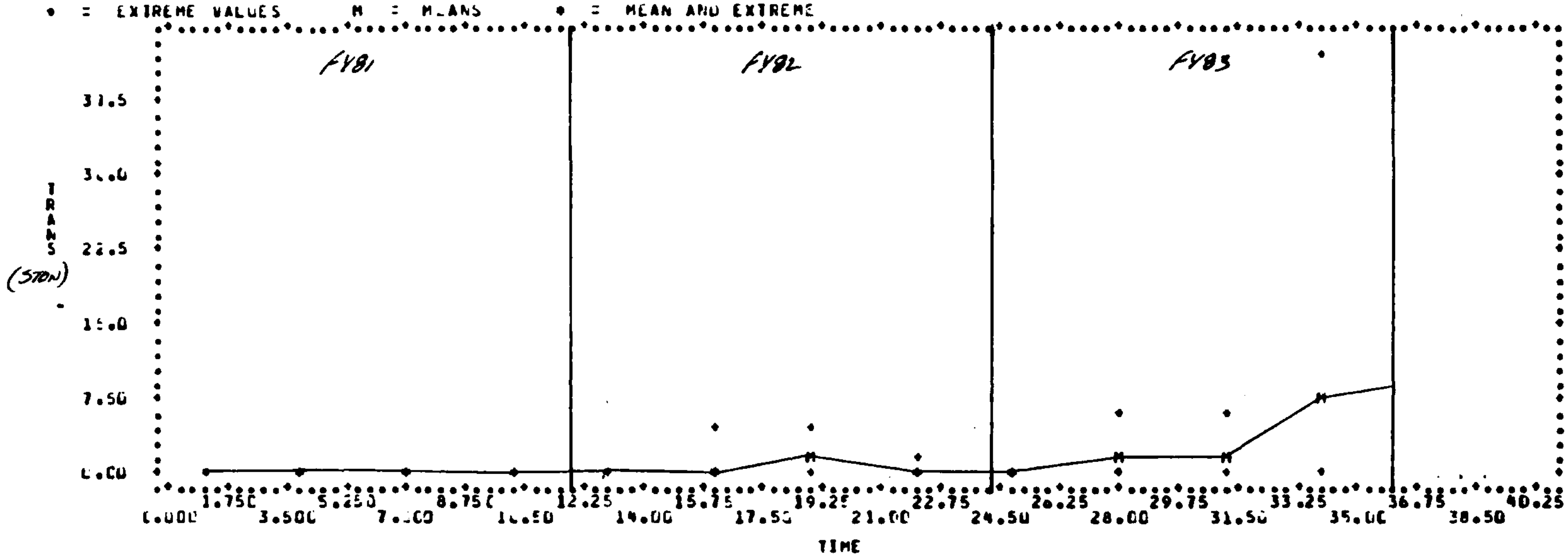


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0642	.1430
4.000	6	[illegible]	.1255	.5590
7.000	6	[illegible]	.1510	.5580
10.000	6	.0005	.0733	[illegible]
13.000	6	[illegible]	.0519	.2000
16.000	6	[illegible]	[illegible]	.2005
19.000	6	[illegible]	.0861	.1910
22.000	6	.0135	.3210	1.1595
25.000	6	.1785	.8409	2.3990
28.000	6	.1190	1.5258	5.4340
31.000	6	[illegible]	1.3035	5.4340
34.000	6	[illegible]	1.0971	4.4890

H		
0	411	1383
99	60	4798
286	8	357
1116	0	238
5	352	666
0	312	10668
58	199	46
17	73	3023
616	27	1
49	2317	11
1	505	8978
103	731	306

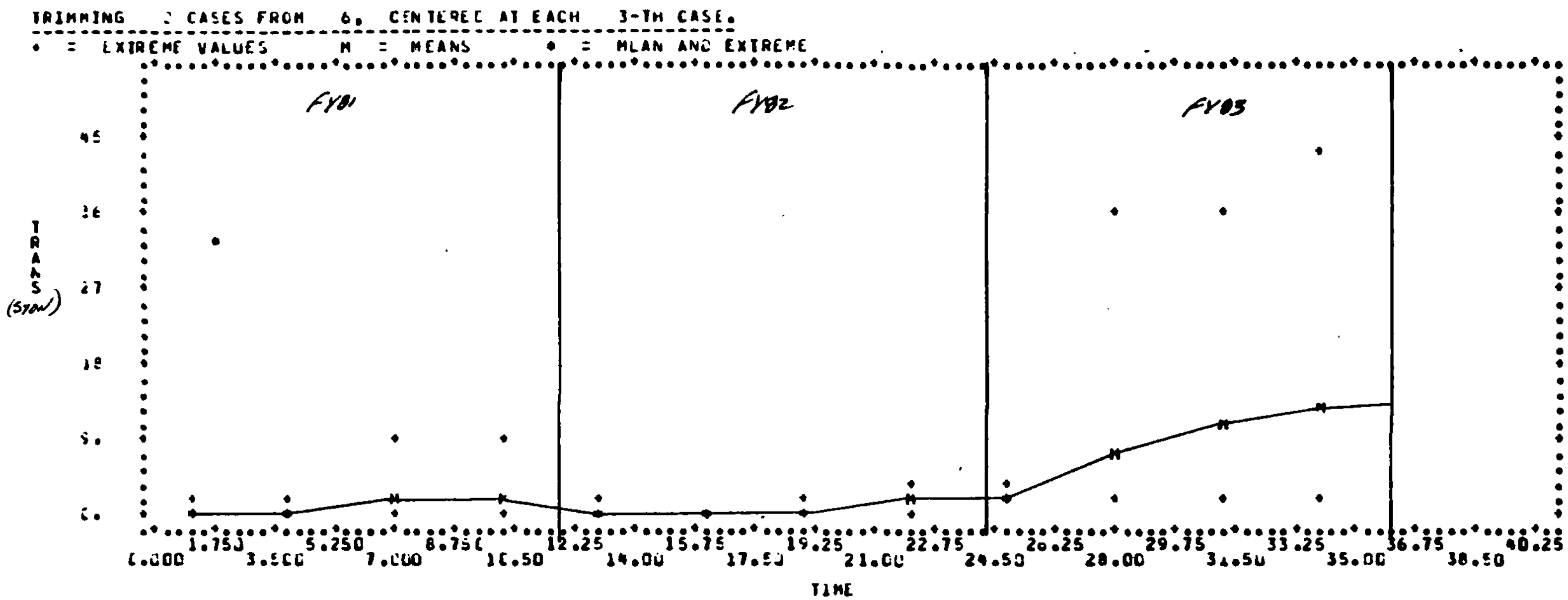
Figure G-25. Three-month Moving Average Schematic
(Tinker to Frankfurt) (STON/month)
(page 1 of 2 pages)

TRIMMING : CASES FROM 5, CENTERED AT EACH 3-TH CASE.
* = EXTREME VALUES M = MEANS * = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	V		
1.000	3	.0080	.0775	.2123	424	5	0
4.000	6	.0080	.1101	.2854	25	12	18
7.000	6	.0280	.1169	.2655	16	164	48
10.000	6	.0000	.0922	.2700	570	7629	14
13.000	6	[illegible]	.0017	.2700	144	34	12264
16.000	6	[illegible]	.6999	3.5145	142	155	767
19.000	6	[illegible]	.6372	3.9145	125	104	144
22.000	6	.0000	.1554	.8625	366	1725	1309
25.000	6	[illegible]	.0085	.7240	56	0	27
28.000	6	[illegible]	1.0926	6.1323	0	2	67
31.000	6	[illegible]	1.2104	6.1323	19	12	164
34.000	6	.0045	7.1097	41.8323	540	22	63664

Figure G-25. Three-month Moving Average Schematic
(Tinker to Frankfurt) (STON/month)
(page 2 of 2 pages)

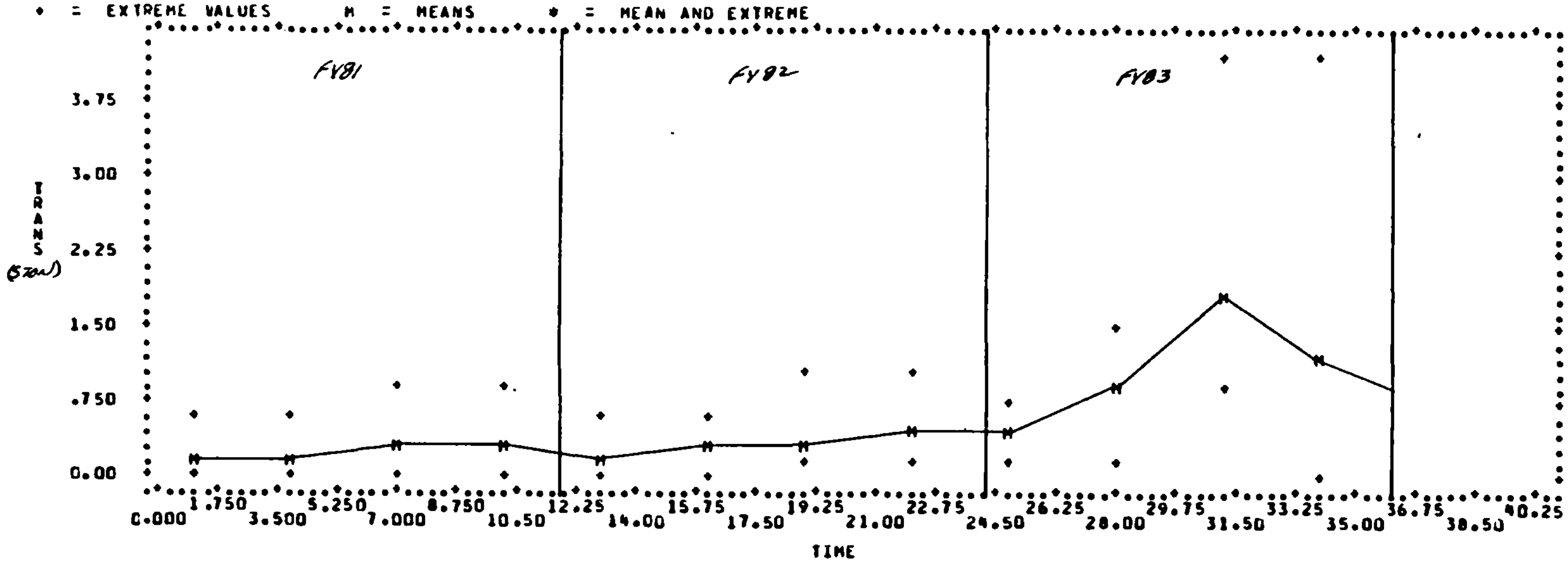


TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE	A		
1.000	3	.0355	.5513	1.4750	267	345	4794
4.000	6	.0355	.5938	1.4750	2950	216	2926
7.000	6	.1964	2.0245	8.1595	71	654	1869
10.000	6	.3433	2.2143	8.1595	392	435	9276
13.000	6	.1030	.6251	1.6215	1083	920	6134
16.000	6	.1030	.3147	.5080	1543	1016	72157
19.000	6	.2175	.4464	1.7155	606	509	28307
22.000	6	.2213	1.2332	2.9670	3471	446	2135
25.000	6	.9345	1.7635	2.9670	16319	2031	7734
28.000	6	.9345	6.0965	36.0785	605	2133	6842
31.000	6	1.0675	10.4787	36.0785	3243	3720	14774
34.000	6	1.0675	11.9694	43.8865	2048	5960	87773

Figure G-26. Three-month Moving Average Schematic
(Tinker to Ramstein) (STON/month)
(page 1 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

◆ = EXTREME VALUES M = MEANS ✱ = MEAN AND EXTREME



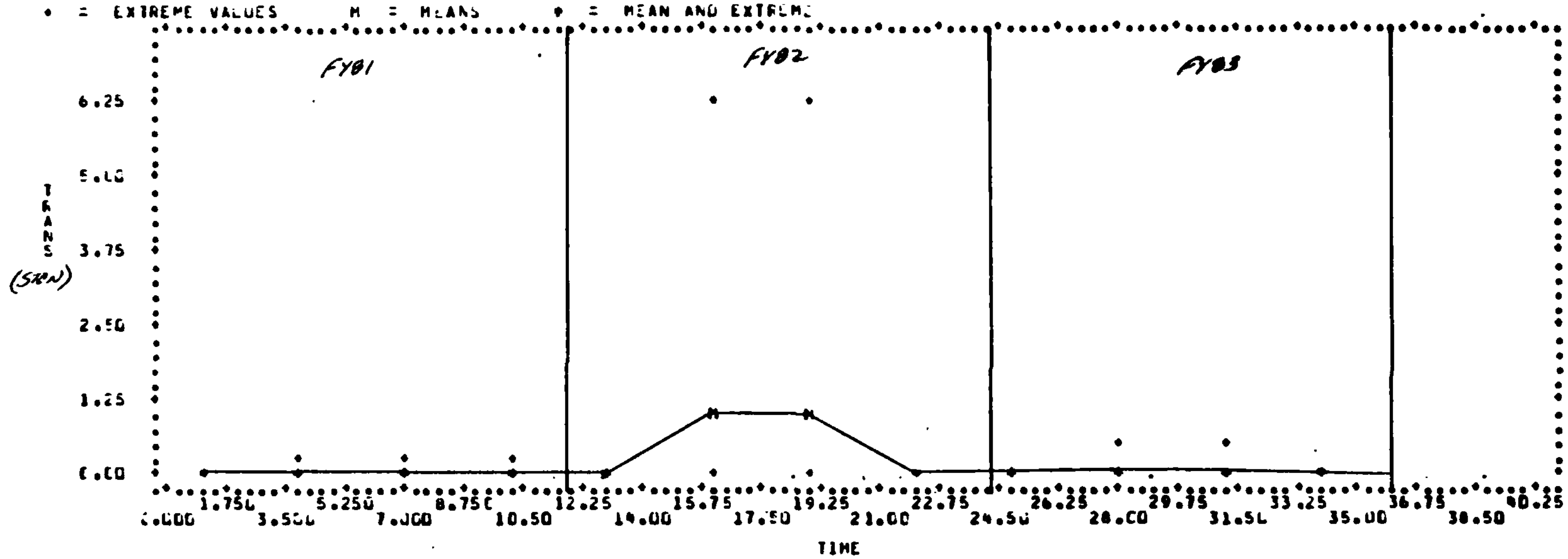
TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.2098	.6270
4.000	6	.0000	.1344	.6270
7.000	6	.0075	.2348	.8330
10.000	6	.0285	.2657	.8330
13.000	6	.0290	.2073	.5985
16.000	6	.0310	.2577	.5985
19.000	6	.0810	.3141	1.0330
22.000	6	.0810	.4068	1.0330
25.000	6	.0940	.4341	.7860
28.000	6	.0940	.8543	1.4535
31.000	6	.8525	1.8257	4.1260
34.000	6	.0000	1.2548	4.1260

H		
0	505	1394
1254	1197	1185
5	62	188
80	210	1705
15	412	2907
259	707	2673
57	162	1037
1666	212	8252
741	2066	4334
58	410	2193
108	1572	300
556	400	335

Figure G-26. Three-month Moving Average Schematic (Tinker to Ramstein) (STON/month) (page 2 of 3 pages)

TRIMMING 0 CASES FROM 6, CENTERED AT EACH 3-TH CASE.

* = EXTREME VALUES M = MEANS ✱ = MEAN AND EXTREME



TIME VALUE	NO. OF CASES	MINIMUM VALUE	MEAN	MAXIMUM VALUE
1.000	3	.0000	.0227	.0525
4.000	6	.0000	.0425	.1330
7.000	6	.0000	.0797	.2750
10.000	6	.0035	.0713	.2750
13.000	6	.0000	.0230	.0925
16.000	6	.0000	1.0511	6.3005
19.000	6	.0000	1.0636	6.3005
22.000	6	.0000	.0134	.0640
25.000	6	.0000	.0079	.0420
28.000	6	.0000	.0791	.3615
31.000	6	.0000	.0865	.3815
34.000	6	.0000	.0183	.0755

V

31	1	2
105	0	84
0	1	0
0	12601	0
108	10	763
266	0	100
16	14	1
550	10	151
16	126	23
165	9	6
7	0	43
82	0	2

Figure G-26. Three-month Moving Average Schematic
(Tinker to Ramstein) (STON/month)
(page 3 of 3 pages)

B	E	C	K
0	0	0	0
1	0	0	0
0	53	0	0
51	0	0	0
0	0	0	0
8	6	0	0
49	0	24	0
653	0	0	0
202	0	22	0
0	0	0	0
39	0	0	0
972	0	0	0
18	0	0	0
0	0	0	0
99	0	0	0
11	0	0	0
0	0	0	0
114	0	0	18
34	65	0	0
0	0	0	0
297	0	0	0
3	0	0	0
0	198	0	0
1	0	0	0
12	0	0	0
88	0	0	0
0	0	0	0
77	0	0	0
1727	1280	0	0
211	0	0	0
693	0	0	0
154	0	0	0
0	0	0	0
217	0	0	0
108	0	0	0
381	0	0	0

C	F	J	M
0	0	2022	827
0	0	2600	0
362	0	4253	0
0	173	4173	0
0	0	2551	0
0	0	2852	0
0	0	3325	0
0	0	4100	0
126	0	7132	0
0	0	6999	0
0	0	7976	5
0	0	4525	0
0	0	6199	13
0	0	3721	4
0	0	4281	0
0	0	3966	0
0	0	3634	0
0	0	4394	0
0	0	4595	0
0	0	6966	0
0	0	9193	0
0	0	10432	65
170	0	21415	54
30	0	13694	27
0	3	12087	67
0	15	20839	632
0	0	22055	0
725	0	33479	59
54	0	29389	111
0	0	74792	16
0	0	68562	0
0	0	88941	200
0	0	60930	0
0	0	53792	0
0	0	93963	0
0	0	97511	0

Figure G-27. Tinker to Ramstein Cargo Distribution List (STON/month) (page 1 of 2 pages)

F	T	X	3
0	0	0	0
0	302	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	251	0	0
0	381	0	0
0	108	0	0
0	0	0	0
0	0	0	0
0	756	0	0
0	142	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	358	0	0
14	71	0	0
2	0	0	0
7	0	0	0
4	0	0	0
0	0	0	0
0	1408	0	0
0	0	0	0
21	232	0	0
0	23	0	0
8	0	0	0
0	0	6	34
0	0	0	0
0	0	0	0
0	2540	0	0
0	0	0	0
0	0	0	0
385	370	0	20944
59	0	0	0

S	W	2	4
0	0	0	0
0	0	0	0
0	505	0	0
0	0	0	0
4	12	0	0
8	337	0	0
0	0	0	0
0	327	0	0
1732	10	0	0
52	28	0	0
10	89	0	0
0	2	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	4	0	0
0	0	0	0
0	183	0	6
15	1	0	28
0	0	2318	48
0	0	2416	0
0	0	0	0
41	0	0	0
9	0	2322	0
0	0	4742	0
71	0	0	0
65	0	14	0
0	0	0	0
0	0	0	0
1963	0	0	179
0	0	446	0
0	0	0	0
46	0	0	0
0	0	0	0
0	0	0	0
370	0	0	0

Figure G-27. Tinker to Ramstein Cargo Distribution List (STON/month) (page 2 of 2 pages)

APPENDIX H

SPONSOR'S COMMENTS

DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR LOGISTICS
WASHINGTON, D.C. 20310-0500

20 NOV 1984

DALO-TSP-C3

SUBJECT: Utilization of Increased Airlift Capability (UIAC) Study.

Director,
US Army Concepts Analysis Agency
ATTN: CSCA-SP
8120 Woodmont Avenue
Bethesda, MD 20814-2797

1. Reference letter, CSCA-SP, USACAA, 9 October 1984, subject as above.

2. Our comments regarding this excellent and timely study are cited on the enclosed Study Critique Sheet pursuant to reference request.

3. Recommended additional distribution addressees are identified at page 17 of the enclosed Distribution List.

SIGNED
FRANCIS W. FRANK
Acting Chief, Transportation
Management Division
Directorate for Transportation
Energy and Troop Support

FW Frank

2 Encls

for
THOMAS F. YOUNG
Colonel, GS
Chief, Transportation
Management Division
Directorate for Transportation,
Energy and Troop Support

(NOT USED)

STUDY CRITIQUE

(This document may be modified to add more space for responses to questions.)

1. Were there any editorial comments? No ______. If so, please list on separate page and attach to the critique sheet.

2. Was the work accomplished in a timely manner? Yes ______. If not, please comment. ______________________________

3. Does the work report address adequately the issues planned for the analysis? Completely . If not, please comment. ______________________________

4. Were appropriate analysis techniques used? Yes ______. If not, please comment. ______________________________

5. Are the findings fully supported by good analysis based on sound assumptions? Yes ______. If not, please explain. ______________________________

6. Does the report contain the preferred level of details of the analysis? Yes ______. If not, please comment. ______________________________

7. Is the written material fully satisfactory in terms of clarity of presentation, completeness, and style? Yes ______. If not, please comment. ______________________________

STUDY CRITIQUE (CONTINUED)

8. Are all Figures and Tables clear and helpful to the reader? Yes.
If not, please comment. ____________________

____

____

9. Does the report satisfy fully the expectations that were present when the work was directed? Entirely. If not, please explain how not.

____

____

____

10. Will the Findings in this report be helpful to the organization which directed that the work be done? Absolutely. If so, please indicate how, and if not, please explain why not.

Findings completely substantiate cargo selection process for DSS cargo and justify fully, rationale for obviating selection of other cargo.

11. Judged overall, how do you rate the study? (circle one)

Poor Fair Average Good Excellent

This excellent, comprehensive study will enable the Army to readily transition to utilization of excess MAC capability with the knowlege that the basis for cargo selection is well founded and principled. Study has the further advantage to the Army of providing an undeniable, fully substantiated methology for cargo selection that will stand the test of any internal or external audit.

APPENDIX I

DISTRIBUTION

Addressee	No of copies
Deputy Chief of Staff for Operations and Plans Headquarters, Department of the Army ATTN: DAMO-ZD Washington, DC 20310	1
Deputy Chief of Staff for Logistics Headquarters, Department of the Army ATTN: DALO-ZA Washington, DC 20310	1
Deputy Chief of Staff for Logistics Headquarters, Department of the Army ATTN: DALO-TSP-C Washington, DC 20310	4
Deputy Chief of Staff for Logistics Headquarters, Department of the Army ATTN: DALO-RMB Washington, DC 20310	1
Deputy Chief of Staff for Logistics Headquarters, Department of the Army ATTN: DALO-SMP-U Washington, DC 20310	1
Commander US Army Logistics Center Fort Lee, VA 23801	1
Commander US Army Logistics Control Activity ATTN: DRXLC-LC Presidio of San Francisco San Francisco, CA 94129	1

Addressee	No of copies
Deputy Chief of Staff for Research, Development, and Acquisition Headquarters, Department of the Army ATTN: DAMA-ZA Washington, DC 20310	1
Deputy Under Secretary of the Army (Operations Research) Washington, DC 20310	1
Chief of Staff, Army ATTN: DACS-DMO Washington, DC 20310	1
Director US Army Materiel Systems Analysis Activity Aberdeen Proving Ground, MD 21005	2
Commander Combined Arms Combat Development Activity Fort Leavenworth, KS 66027	1
Commander Army Research Institute 5001 Eisenhower Avenue Alexandria, VA 22333	1
Commander US Army Logistics Evaluation Agency New Cumberland Army Depot New Cumberland, PA 17070	1
Director Defense Logistics Studies Information Exchange US Army Logistics Management Center Fort Lee, VA 23801	1

Addressee	No of copies
Defense Technical Information Center ATTN: DTIC-DDA Cameron Station Alexandria, VA 22314	2
The Pentagon Library (Army Studies Section) ATTN: ANRAL-RS The Pentagon Washington, DC 20310	2
Joint Deployment Agency Deploying Systems Division MacDill Air Force Base, FL 33608	1
Commandant US Army War College ATTN: Library Carlisle Barracks, PA 17013	1
Air University ATTN: ACDY Maxwell Air Force Base, AL 36112	1
Commandant US Air War College Maxwell Air Force Base, AL 36112	1
Commandant US Navy War College Newport, RI 02840	1
Commandant Industrial College of the Armed Forces Fort McNair Washington, DC 20319	1
Commandant Armed Forces Staff College Norfolk, VA 23511	1

Addressee	No of copies
Commandant US Army Command and General Staff College Fort Leavenworth, KS 66027	1
Commandant United States Military Academy ATTN: Mathematics Department West Point, NY 10996	1
Commandant US Army Transportation School Fort Eustis, VA 23604	1
Commander US Military Traffic Management Command Washington, DC 20315	2
Commander US Army Materiel Command 5001 Eisenhower Avenue Alexandria, VA 22333	1
Commander in Chief Military Airlift Command Scott Air Force Base, IL 62225	1
Commander Military Sealift Command Ship Operations Branch 4228 Wisconsin Avenue Washington, DC 20390	1
Commander US Army Materiel Command ATTN: AMCSM-PST 5001 Eisenhower Avenue Alexandria, VA 22333	4

Addressee	No of copies
Deputy Chief of Naval Operations (Logistics) ATTN: NOP 414 Washington, DC 20350	1
Commander in Chief US Army Europe and Seventh Army ATTN: AEAGD-TM APO New York 09403	1
Commander US Army, Eight ATTN: DJ-T APO San Francisco 96301	1
Commander US Army, Japan ATTN: AJGD-T APO San Francisco 96343	1
Commander 4th Transportation Command ATTN: AEUTR-MOV APO New York 09451	1
HQ USAF ATTN: LET Washington, DC 20330	1
Internal Distribution	
CAA Technical Library	2

GLOSSARY

AACA	Army Air Clearance Authority
AAFES	Army and Air Force Exchange System
ACA	Air Clearance Authority
AEC	air eligibility code
AFR	Air Force Regulation
ALOC	air line(s) of communication
ALP	Air Logistic Pipeline
AMC	US Army Materiel Command
AMCCOM	US Army Armament, Munitions, and Chemical Command
APOD	aerial port of debarkation
APOE	aerial port of embarkation
ASIF	Airlift Service Industrial Fund
CA	cost avoidance
CCP	container consolidation point
CMMS	Congressionally Mandated Mobility Study
COMSCINST	Commander Military Sealift Command Instruction
CONUS	Continental United States
CRAF	Civil Reserve Air Fleet
DLA	Defense Logistics Agency
DS	direct support
DSS	direct support system
DTS	Defense Transportation System
EEA	essential element(s) of analysis
HHG	household goods
GS	general support

GSA	General Services Administration
JCS	Joint Chiefs of Staff
LCA	US Army Logistics Control Activity
M	million
MAC	Military Airlift Command
MADM	multiple attribute decisionmaking
MICOM	US Army Missile Command
MILSTAMP	Military Standard Transportation and Movement Procedures
MODLOG	modernization of logistics
MSC	Military Sealift Command
MTMC	Military Traffic Management Command
MTM/D	million ton miles/day
MTON	measurement ton(s)
NICP	National Inventory Control Point
NOS	not otherwise specified
OCONUS	outside Continental United States
ODCSLOG	Office of the Depute Chief of Staff for Logistics
O&M	operations and maintenance
OST	order-ship-time
PLL	prescribed load list
PM	project manager
POD	port of debarkation
POE	port of embarkation
POM	Program Objective Memorandum
POV	privately owned vehicle
RAM	rated aircrew management

REAL	Routine Economic Arilift
RDD	required delivery date
S-A	surface cost - airlift cost
SAAM	special assignment airlift mission
SSCO	Shipper Service Control Office
STON	short ton(s)
TCMD	Transportation Control and Movement Document
TOA	Transportation Operating Agency
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
TP	transportation priority
UIAC	Utilization of Increased Airlift Capability
USAF	US Air Force
USAMSAA	US Army Materiel Systems Analysis Activity
USAREUR	US Army Europe

CAA

UTILIZATION OF INCREASED AIRLIFT CAPABILITY (UIAC) STUDY

STUDY SUMMARY CAA-SR-84-29

THE REASONS FOR PERFORMING THE STUDY were to determine the Army's allocation of unsubscribed capacity, and develop a process to assist the sponsor is selecting the most suitable cargo and route combinations to utilize the Army's allocation.

THE PRINCIPAL FINDINGS of this study are:

(1) The Military Airlift Command's (MAC) flying hour program and scheduled procurement of new aircraft are the major determinants in identifying air routes with additional or unsubscribed capacity.

(2) The Army's projected allocation of unsubscribed capacity is 55 percent of the total amount available.

(3) MAC's proposed Airlift Service Industrial Fund (ASIF) incentive tariff rate favors diverting Army-sponsored cargo packed at seaport terminals to realize transportation cost avoidances.

(4) Sufficient amounts of air eligible port-packed cargo to fill the Army's projected allocation of unsubscribed capacity will not be available beyond FY 86.

(5) Significant increases in forecasted amounts of unsubscribed capacity suggest the Army reconsider utilizing its allocation for airlift resupply.

THE MAIN ASSUMPTIONS upon which this study is based are:

(1) Increases in unsubscribed capacity detailed in MAC's study, "Airlift Management in a New Era," are accurate.

(2) Peacetime airlift commitments from the Civil Reserve Air Fleet (CRAF) will be retained and increased commensurate with increases in MAC fleet capability.

(3) Proposed ASIF tariff changes will be implemented.

(4) Projected increases in unsubscribed capacity will not be assigned in support of Joint Chiefs of Staff (JCS) exercises.

THE PRINCIPAL LIMITATION of the work which might affect the findings is that the historical lift data extracted from MAC, the Military Sealift Command (MSC), and Military Traffic Management Command (MTMC) records could not be validated by Army sources.

THE SCOPE OF THE STUDY includes an examination of the Army's requirement for over-ocean movement of Army-sponsored cargo in the 1984-1989 timeframe, and the development of a process to select the cargo route combinations best suited to use the additional airlift capacity.

THE STUDY OBJECTIVES were:

(1) Identify the range of unsubscribed airlift capacity that will be made available to the Army.

(2) Develop criteria for the selection of cargo categories suitable for airlift..

(3) Identify the data that affect the selection of cargo and route combinations most suitable for airlift.

(4) Develop and document a cargo and route selection process for use by the sponsor.

THE BASIC APPROACH followed in this study was to define the Army transportation requirements for sealift and airlift, determine the Army's allocation of unsubscribed capacity, and then develop a methodology to assist the sponsor in selecting the most suitable cargoes and air routes to utilize the Army's capacity allocation. Historical lift data detailing Army peacetime cargo movements were then collected to facilitate the selection of air-eligible surface cargoes for diversion and, finally, the transportation cost avoidances resulting from the diversion were computed.

THE STUDY SPONSOR was the Deputy Chief of Staff for Logistics who sponsored the work, established the objectives, and monitored the study activities.

THE STUDY EFFORT was directed by CPT(P) Jeffrey A. Sorenson, Strategy, Concepts and Plans Directorate.

COMMENTS AND QUESTIONS may be sent to the US Army Concepts Analysis Agency, ATTN: Assistant Director for Strategy, Concepts and Plans, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

END

FILMED

1-85

DTIC